



M12 Motorway Groundwater Monitoring

Report 10 – October 2023 to March 2024

Transport for NSW

02 July 2024

→ **The Power of Commitment**



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Acknowledgement of Country

GHD acknowledges Aboriginal and Torres Strait Islander peoples as the Traditional Custodians of the land, water and sky throughout Australia on which we do business. We recognise their strength, diversity, resilience and deep connections to Country. We pay our respects to Elders of the past, present and future, as they hold the memories, knowledges and spirit of Australia. GHD is committed to learning from Aboriginal and Torres Strait Islander peoples in the work we do.



Executive Summary

Background

The M12 Motorway (the project) is under construction between the M7 Motorway at Cecil Hills, and The Northern Road at Luddenham, covering a distance of approximately 16 kilometres (km). This construction will provide direct access between the Western Sydney International Airport (WSIA) at Badgerys Creek and Sydney's motorway network.

The Instrument of Approval granted by NSW Government Department of Planning, Industry and Environment in April 2021 stipulates conditions of approval for the M12 Motorway SSI 9364. Condition C17 of the approval requires the construction monitoring program for surface water quality and groundwater quality and levels (as approved by the Planning Secretary) to be implemented for the duration of construction.

Condition D9 of the approval requires the operational monitoring program for surface water quality and groundwater quality and levels to be implemented for the duration specified in the program.

- The amendment report submissions report states in Revised Environmental Management Measure (REMM) SWH06 that surface water monitoring will be carried out for a minimum of 12 months following the completion of construction.
- GW04 states that groundwater quality monitoring will be carried out for a minimum of six months following construction.

To meet these conditions of approval, GHD Pty Ltd (GHD) was engaged by Transport for New South Wales (TfNSW) to undertake the groundwater monitoring program for the M12 Motorway construction and operation project. This report summarises the construction phase of the groundwater monitoring program conducted between October 2023 and March 2024.

Scope of work

The scope of works undertaken to support the preparation of this report include:

- Monthly sampling the redrilled monitoring wells (BH104R, BH107R, BH112R and BH145R) along the proposed project alignment over the six months. The analytical suite includes physiochemical parameters, nutrients, major anions and cations, metals, pesticides, and hydrocarbons.
- Collation of groundwater level data from the same wells which includes data from manual gauging and data loggers.
- Collation of groundwater level data from the remaining monitoring wells which includes data from bi-monthly manual gauging and data loggers.

Summary of monitoring data

The groundwater analytical results for the six-month monitoring period (October 2023 to March 2024) indicated the following differences between the baseline and construction monitoring period:

- Field parameters
 - Increases in dissolved oxygen at BH104/BH104R, BH107/BH107R and BH112/BH112R.
 - Fluctuations in electrical conductivity and redox in all wells after monitoring of replacement wells.
 - pH concentrations are tending more alkaline across all wells.
- Major cations and anions
 - Decreases in sulfate concentrations at BH104/BH104R and BH107/BH107R, and increases at BH112/BH112R after monitoring of replacement wells.
 - Major cations and anions in replacement wells are different from their original wells. BH104R has reduced calcium and magnesium and BH107R has increases in bicarbonate and carbonate ions towards a sodium bicarbonate type. BH112R has increased towards chloride and BH145R has increased towards calcium and magnesium.

- Nutrients
 - Increases in concentrations above the baseline at BH104/BH104R, BH107/BH107R and BH112/BH112R for ammonia coinciding with monitoring of the replacement wells.
 - Increases in nitrate, total oxidised nitrogen (NO_x), and total nitrogen above the baseline which are mostly reducing with each monitoring event after monitoring of replacement wells.
 - Fluctuating nitrite concentrations above the baseline since the beginning of the construction period at BH104/BH104R, BH107/BH107R and BH112/BH112R.
- Metals
 - Arsenic 80th percentile concentrations in the current and construction period were reported above the baseline in BH104/BH104R and BH112/BH112R. This may be attributable to increased concentrations coinciding with the monitoring of the replacement wells.
 - Iron 80th percentile concentrations in the current and construction monitoring periods were reported above the baseline 80th percentile at BH104/BH104R.
 - Exceedances of adopted criteria were eliminated following the application of hardness modified trigger values.
- Total Suspended Solids (TSS) and Total Dissolved Solids (TDS)
 - An increasing trend in TSS concentrations above the baseline at BH104/BH104R and BH112/BH112R, for the construction period which may be attributed to the monitoring of replacement wells. In the current period BH112/BH112R has TSS has decreased significantly and is below the baseline 80th percentile.
 - TDS concentrations in BH112/BH112R for the current and construction periods at the 80th percentile are above the baseline 80th percentile.
 - Increasing trend of TDS concentrations at BH145R since the start of the construction period, where the current period 80th percentile is above the construction period 80th percentile.

It is noted that there are differences in field parameters and laboratory analytical results between the original wells BH104, BH107, BH112, and BH145 with their replacements BH104R, BH107R, BH112R, and BH145R.

Summary of gauging data

- In the western area, groundwater levels in:
 - BH104R decreased by over two metres since monitoring of the replacement well, though in the current period have been on a slight increasing trend.
 - BH107R remained relatively stable in the current period with a very slight decrease (less than 0.1 m), continuing an overall decreasing trend observed in Bh107R since monitoring of the replacement well.
 - BH112R slightly decrease, with a change in water level of less than one metre since monitoring of the replacement well.
- In the central area, water levels in replacement well BH145R remained relatively stable over the current monitoring period. Gauging well BH219 remained relatively stable through the monitoring period.
- In the eastern area, water levels in wells BH162 and BH175 have a slight decreasing trend in height, dropping less than 1m during the monitoring period. BH162 was destroyed in the current period, and BH170 remained unable to be located.
- This decreasing trend observed in western and eastern wells coincides with a period of reduced rainfall, with the water levels remaining within the historical range since monitoring began.

Conclusion

The measured groundwater quality parameters and the project analytical suite have provided further data to incorporate into the construction monitoring period percentiles. The reported concentration of analytes in the current monitoring period are broadly consistent with those reported in the baseline monitoring period, with noted increases in nutrients and metals concentrations. These increases have occurred with the replacements of the monitoring wells and therefore no management actions are required cumulating from this monitoring period.

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1. Introduction

GHD Pty Ltd (GHD) was engaged by Transport for New South Wales (TfNSW) to undertake the groundwater monitoring program for the M12 Motorway construction and operation project.

This biannual report is the tenth for the monitoring program. This report (Report 10) provides details of the monitoring locations, sampling methodology, and results of the groundwater samples collected between October 2023 to March 2024.

This current monitoring period and six-monthly report sits under contract number 20.0000303606.0590.

1.1 Background

The M12 Motorway construction works area (the project) in Western Sydney covers approximately 16 kilometres (km). The project is under construction between the M7 Motorway at Cecil Hills and The Northern Road at Luddenham. At the completion of the project, the M12 Motorway will provide direct access between the Western Sydney International Airport (WSIA) at Badgerys Creek and Sydney's motorway network.

The project has been determined to be a controlled action under Section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act) (EPBC 2018/8286) for significant impact to threatened species and communities (Section 18 and Section 18A of the EPBC Act). This requires assessment and approval from the Commonwealth Government. As part of the project approval conditions, Transport for NSW (TfNSW) are required to prepare and implement a groundwater monitoring program for the project. GHD was commissioned to undertake a groundwater monitoring program during pre-construction, construction, and operational stages of the project.

A groundwater quality and hydrology assessment report was previously prepared as part of the M12 Motorway Environmental Impact Statement (JAJV, 2019). A key part of this report included a dewatering assessment, to estimate potential groundwater inflows (seepage) and subsequent potential drawdown which could occur if road cuttings extend below the water table. The JAJV 2019 assessment concluded that the project had minimal potential for direct interaction with groundwater systems. The potential for interactions with groundwater systems was noted to be limited to one road cutting, approximately 1.5 km east of The Northern Road (the 'western cut'), and bridge footings where piles are drilled below the water table.

JAJV (2019) stated that groundwater quality at groundwater monitoring well BH104 was representative of the western cut, with initial sampling of this monitoring well indicating copper and zinc concentrations exceeding (ANZECC & ARMCANZ, 2000) trigger values for 95% protection of freshwater species. Groundwater quality from BH104 did not indicate a risk to human health, nor anticipated impacts from intercepted groundwater from the cut being discharged to surface water. Changes to water table levels in areas where bridge footings extend beneath the water table are qualitatively predicted to be minor and localised.

The Overarching Construction Environmental Management Plans (OCEMP) for the project was approved by the Department of Planning and Industry Environment (DPIE) in December 2021 (TfNSW, 2021).

Between April 2019 and July 2022, GHD monitored four groundwater monitoring wells in the pre-construction phase for the collection of baseline data. The collection of baseline data was completed in July 2022 as the pre-construction phase for the central and west packages, including the four groundwater wells, ended. Construction phase data has been collected from August 2022 onwards.

The groundwater monitoring program conducted to date can be summarised as follows:

- Baseline monitoring period:
 - Report 1: April 2019 to September 2019 (GHD, 2019)
 - Report 2: October 2019 to March 2020 (GHD, 2020)
 - Report 3: April 2020 to September 2020 (GHD, 2021a)
 - Report 4: October 2020 to March 2021 (GHD, 2021b)
 - Report 5: April 2021 to September 2021 (GHD, 2022a)

- Report 6: October 2021 to March 2022 (GHD, 2022b)
- Baseline / construction monitoring period:
 - Report 7: April 2022 to September 2022 (GHD, 2022c)
- Construction monitoring period:
 - Report 8: October 2022 to March 2023 (GHD, 2023a)
 - Report 9: April 2023 to September 2023 (GHD, 2024)
 - Report 10 (This report): October 2023 to March 2024

1.2 Scope of work

For the duration of the pre-construction, construction, and operational phases, GHD is to undertake a monthly groundwater monitoring event at each of the monitoring locations within the project.

The pre-construction monitoring was to occur for a minimum of 12 months, followed by four years of construction monitoring on a stage-by-stage basis, followed by post-construction (operation) monitoring commencing at the opening of each stage.

The scope for the groundwater monitoring events undertaken within the project includes:

- Monthly sampling of four existing monitoring wells (BH104, BH107, BH112 and BH145) along the proposed project alignment including groundwater levels using an interface probe (IP) to determine presence of light non-aqueous phase liquid (LNAPL) and measure groundwater levels.
- Collection of samples from four existing monitoring wells (BH104, BH107, BH112 and BH145) using a micro-purge pump, employing low-flow sampling methodology to determine water quality and estimate flow direction.
- Bi-monthly (every second month) gauging of twenty-five existing monitoring wells along the project alignment using an interface probe (IP) to measure groundwater levels and downloading of the data loggers (if present).
- Collation and graphing of groundwater level data from all twenty-nine wells which includes data from manual gauging and data loggers.
- Preparation of one monitoring report every six months.

As the construction phase has progressed, samples are now collected from four re-drilled monitoring wells (BH104R, BH107R, BH112R and BH145R), and bi-monthly groundwater gauging is only conducted on the remaining three wells.

1.3 Limitations

This report has been prepared by GHD for Transport for NSW and may only be used and relied on by Transport for NSW for the purpose agreed between GHD and Transport for NSW as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Transport for NSW arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 1.4 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

2. Project description

2.1 Project identification

A summary of available information pertaining to the project is presented in Table 1. A location plan of the project is provided in Figure 1, Appendix A

Table 1 Project identification summary

Information	Details
Description of the project	The M12 Motorway project alignment is approximately 16 km in length. This will extend between the M7 Motorway at Cecil Hills and The Northern Road at Luddenham.
Local Government Area	Liverpool City Council for the eastern portion, up to Mamre Road Penrith City Council from Mamre Road
Local Land Use Zoning	Liverpool LEP 2008 RU4 – primary production small lots Fairfield LEP 2013: RU4 – primary production small lots RU1 – primary production Penrith LEP 2010: RU4 – primary production small lots C2 – environmental conservation RU2 – rural landscape SP2 – classified road State Environmental Planning Policy (Western Sydney Aerotropolis) 2020: ENZ – environment and recreation ENT – enterprise SP2 – infrastructure SEPP (Western Sydney Parklands) 2009: Western Sydney Parklands
Land Use	The area where the project is occurring is currently used for agricultural, industrial, residential and rural purposes. Potentially contaminating activities within and / or next to the project include the SUEZ Kemps Resource Recovery Park, Brandown Quarry and general agricultural land use.
Surrounding Land Use	A range of land uses including industrial, commercial, residential, agriculture and landfill surround the project. Potentially contaminating activities outside of the project include the Hi-Quality Group Quarry and Sydney Recycling Park (located adjacent to the Hi-Quality Group Quarry). An Ampol service station is located approximately 300 metres north east of the project at 1163 Mamre Road, Kemps Creek. Regulation under the Contaminated Land Management (CLM) Act is not required.

2.2 Historical land use summary

A historical aerial photography review of the project and surrounding area was completed by JAJV (2019). The review indicated that the project and surrounding area has remained largely rural/agricultural and residential since the 1940s. Increased rural residential density in suburban pockets, and the number of commercial/industrial premises in Kemps Creek have been observed since the 1950s and 1960s until present-day.

2.3 Environmental setting

JAJV (2019) undertook a desktop review of the existing environment for the entire M12 Motorway construction footprint. A summary of this information is presented in Table 2.

Table 2 Environmental setting summary

Aspect	Description
Climate	The long-term average monthly rainfall for the project ranges between 33.0 millimetres (mm) in July to 107.9 mm in February, with an average annual rainfall of 726.2 mm (Badgerys Creek AWS, ID 067108) (BOM, 2024). Long-term maximum mean temperatures range between 17.6°C in July to 30.0°C in January, and minimum mean temperatures between 4.2°C in July to 17.2°C in January (Badgerys Creek AWS, ID 067108) (BOM, 2024). Further details of climate information are included in groundwater level monitoring of Section 6.4 and Appendix I.
Topography and drainage	The ground surface along the project ranges between reduced level (RL) 70 metres (m) Australian Height Datum (AHD) to RL 115 mAHD. The landscape comprises relatively flat terrain with low rising crests. Flat floodplains are present at South Creek and Kemps Creek. Low rolling hills are situated between the floodplain areas, typically comprising gentle rises and undulations with broad rounded crests. Based on the topography within the project, surface runoffs are expected to drain to nearby dams and creeks (i.e. Kemps Creek and South Creek), as well as infiltrating into subsurface soils across unsealed lands in the surrounding area.
Soil and landscapes	The project is primarily underlain by the Blacktown residual soil unit (Geological Survey of NSW, 1991). The South Creek and Kemps Creek areas are underlain by the South Creek fluvial soil landscape. The Blacktown residual soil landscape typically comprises of clayey soils over gently undulating crests. The soil unit can have moderately reactive, highly plastic subsoils and poor drainage. The South Creek fluvial soil comprises floodplains and drainage depressions of very deep layered clays and sands. These fluvial soils are prone to erosion and frequent flooding.
Acid sulfate soils (ASS)	The project is not covered by areas mapped in the Acid Sulfate Soil Risk Maps prepared by Department of Land and Water Conservation.
Geology	Majority of the project is underlain by two geological units, Bringelly Shale (Rwb) and Quaternary aged alluvial deposits (Qal) (Geological Survey of NSW, 1991). Bringelly Shale is the predominant geological unit for the project. Bringelly shale is described as comprising shale, carbonaceous claystone, laminite and rare coal. Bringelly Shale is the upper portion of the Wianamatta Group and the upper sedimentary sequence in the Sydney Basin with a thickness of typically 150 m. Quaternary aged alluvial deposits (Qal) are described as comprising quartz and lithic fluvial sand, silt and clay. These are present near South Creek and Kemps Creek.
Hydrology	The project crosses South Creek in the western portion and Kemps Creek in the eastern portion. Kemps Creek is a tributary of South Creek, joining approximately three kilometres north of Elizabeth Drive, which then flows north to discharge into the Hawkesbury River.
Hydrogeology	The underlying aquifers are dominated by shale, siltstone and other sedimentary basins. They have a low potential for groundwater movement and comprise salinity levels greater than 16,000 microsiemens per centimetre (µs/cm), being unsuitable for stock use (DPI, 2014). According to the manual groundwater gauging data collected during the baseline and construction monitoring periods (April 2019 to March 2024), groundwater levels within the project range between 34.84 mAHD (BH217, September 2022) and 114.17 mAHD (BH162, October 2022).

3. Field program

3.1 Workplace health and safety

GHD developed a site-specific health safety and environment (HSE) plan for the works as part of the overall commitment to provide a healthy and safe working environment for staff. All work was conducted with appropriate personal protection equipment (PPE).

The HSE plan included a site-specific job safety and environmental analysis detailing the step-by-step procedures of all aspects of the works and associated hazards and control measures to be implemented. The HSE plan was read by all GHD personnel, and feedback and discussion provided prior to the works commencing. A site-specific pre-start safety assessment was conducted each morning before commencing works.

3.2 Sampling dates

Groundwater sampling was conducted at accessible groundwater monitoring wells on the following dates:

- Event 55 – 6 October 2023
- Event 56 – 8 and 9 November 2023
- Event 57 – 5 and 6 December 2023
- Event 58 – 18 and 19 January 2024
- Event 59 – 13 and 14 February 2024
- Event 60 – 14 and 15 March 2024

A summary of the status of groundwater monitoring wells during this monitoring period, and previous monitoring events, is presented in Table B1, Appendix B.

3.3 Summary of groundwater quality monitoring locations

The locations for groundwater quality monitoring wells are summarised below in Table 3 and presented on Figure 1, Appendix A. These monitoring wells are located in the vicinity of the project and were chosen as they represent areas of relatively substantial road cuttings and therefore there is a higher potential for groundwater interception by the project alignment in these areas.

BH104R, BH107R, and BH112R were added to the monitoring program in December 2022 to replace monitoring wells BH104, BH107 and BH112 that were destroyed by the expansion of the construction footprint. BH145R was added to the monitoring program in April 2023 to replace well BH145 which had not been intersecting the groundwater aquifer.

Due to access restrictions of BH112R between December 2022 and May 2023, BH112R was redrilled for a second time in June 2023, and sampled for the first time in August 2023 after well development had occurred. BH144 was temporarily added to the program in November 2022 to provide additional monitoring data before it was destroyed in December 2022.

Table 3 Groundwater quality monitoring locations

Well ID	Latitude	Longitude	Package	Comment
BH104	-33.854952	150.7055015	West	Located on private property, access negotiated with landowner. Destroyed in December 2022.
BH104R	-33.854024	150.7056504	West	Located on TfNSW property. Installed and monitored from December 2022.

Well ID	Latitude	Longitude	Package	Comment
BH107	-33.854432	150.7146769	West	Located on private property, access negotiated with landowner. Destroyed in December 2022.
BH107R	-33.854092	150.7146021	West	Located on TfNSW property. Installed and monitored from December 2022.
BH112	-33.855866	150.7195004	West	Located on TfNSW property. Destroyed in December 2022.
BH112R	-33.855998	150.71932242	West	Located on TfNSW property. Originally installed in December 2022 but could not be sampled due to access restrictions. Redrilled and monitored from August 2023.
BH144	-33.879915	150.8229921	Central	Located on TfNSW property.
BH145	-33.880292	150.8253916	Central	Located in Sydney Parklands Reserve, negotiated access. Destroyed in April 2023. No longer monitored due to low water column.
BH145R	-33.855066	150.720140	Central	Located on TfNSW property. Installed and monitored from April 2023.

3.4 Groundwater sampling methodology

All fieldwork was conducted in general accordance with:

- Australian Standard 5667:1998 Water Quality – Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples (AS 5667.1:1998);
- Australian Standard 5667:1998 Water Quality – Sampling, Part 11: Guidance on the Sampling of Groundwaters (AS 566.11:1998); and
- GHD standard operating procedure for groundwater well sampling (GHD, 2015).

3.4.1 Gauging

Groundwater gauging and monitoring locations were gauged routinely on a monthly basis where possible. At each location, the well cap was removed, and time was allowed for the groundwater level to stabilise before any measurements were collected. The calibration certificates are provided in Appendix E. Groundwater gauging results are presented in Section 6.3.

A calibrated IP was used to measure the standing water level in metres below top of casing (mbTOC), and to determine whether LNAPL was present in the well. Measurements were taken to the nearest millimetre. The depth to the bottom of the well was also measured to determine the amount of water in the casing.

Water level meters (WLMs) are also present in most of the groundwater monitoring well locations associated with this project. This data is presented in Section 6. These groundwater wells are gauged and data downloaded every second month.

Whilst a number of these groundwater wells are located on private property, they are in the M12 alignment and access to these properties will change as the construction phase progresses.

3.4.2 Purging

A micropurge Q10 bladder-pump unit with CO₂ gas controller was used to purge and to draw a sample from the wells.

The monitoring wells were constructed with a three-metre screened casing from the bottom of the well. The pump was lowered to approximately one metre above the bottom of the well to ensure the pump inlet was within the screened interval.

A calibrated water quality meter was used to measure and record water quality parameters, including pH, electrical conductivity (EC), dissolved oxygen (DO), temperature, oxidation-reduction potential (redox) and standing water level (SWL) at regular intervals (e.g. every 2 to 5 minutes).

Descriptions of visual and olfactory characteristics, such as colour, turbidity, odour, and sheen were recorded along with SWL and field water quality parameters.

Water quality parameters were considered stable once three consecutive readings were obtained within the following ranges:

- ± 0.05 for pH
- $\pm 3\%$ for EC
- $\pm 10\%$ for DO
- ± 0.2 °C for temperature
- ± 10 mV for Eh.

Exceptions to this methodology occur when water quality parameters do not stabilise over a long period of time e.g., greater than one hour of purging. This occurred at BH107R in March 2024 when all parameters except DO were stable.

Additionally, low-yielding wells with poor recovery may require samples to be collected prior to stabilisation of field parameters and/or SWL, ensuring groundwater samples are collected prior to the well being pumped dry. There were no occurrences of this in the current monitoring period.

Calibration certificates for the monitoring equipment used are provided in Appendix E.

3.4.3 Sampling

Groundwater samples were transported on ice and submitted to ALS (primary laboratory) and Eurofins (secondary laboratory), both National Association of Testing Authorities (NATA) Australia accredited laboratories, under Chain of Custody (CoC) procedures (presented in Appendix H). A maximum of four primary samples were collected during each sampling event. The NEPM (NEPC, 2013) states that split samples should be collected at a rate of one per 20 primary samples. As such, one intra-laboratory duplicate and one inter-laboratory duplicate sample were collected per event as part of the current groundwater monitoring period between October 2023 and March 2024.

3.5 Laboratory analytical schedule

All samples were analysed by ALS Environmental (primary) and Eurofins (secondary), NATA accredited laboratories. The analytical schedule for groundwater is presented in Table B4, Appendix B, and summarised below.

Groundwater samples were submitted for laboratory analysis including:

- Dissolved heavy metals (arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, and zinc).
- Total recoverable hydrocarbons (TRH).
- Benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN).
- Nutrients (including ammonia, nitrate, nitrite, total nitrogen, total phosphorus and reactive phosphorus).
- Total dissolved solids (TDS).
- Total suspended solids (TSS).
- Major anions and cations with alkalinity (chloride, sulphate, sodium, potassium, magnesium, calcium, carbonate and bicarbonate).
- Total hardness as CaCO₃.
- Polyaromatic hydrocarbons (PAH) (only in January 2024).
- Phenols (only in January 2024).

The laboratory analytical schedule is consistent with the groundwater monitoring indicator requirements as stated in the EIS (JAJV, 2019). The OCEMP (TfNSW, 2021) includes PAH and phenols which are not usually analysed in the program due to consistent non-detections in the baseline period, though were analysed for one round in

January 2024 to meet the requirements of the OCEMP as per the recommendations in Report 9. The additional analysis of total hardness was to allow the adjustment of threshold criteria for metals based on hardness data.

Table 4 depicts the differing analytical suites employed over the course of the monitoring program.

Table 4 *EIS compliance of analytical schedule*

Sampling event	Compliant with required EIS monitoring indicators?	Additional analyte analysis?
Report 1 (GHD, 2019) Event 1 to Event 6 (April to September 2019)	Mostly yes – Did not sample for iron (dissolved), manganese (dissolved), TDS or TSS	Additionally sampled for PAH, phenols, OCP, OPP, fungicides
Report 2 (GHD, 2020) Event 7 to Event 12 (October 2019 to March 2020)		
Report 3 (GHD, 2021a) Event 13 – April 2020 Event 14 – May 2020		
Report 3 (GHD, 2021a) Event 15 – June 2020	No samples collected	
Report 3 (GHD, 2021a) Event 16 – July 2020 Event 17 – August 2020 Event 18 – September 2020	Yes	No
Report 4 (GHD, 2021b) Events 19 to 24 (October 2020 to March 2021)	Yes (however no samples collected at BH107 and BH112 in November 2020 due to access restrictions)	Hardness as CaCO ₃
Report 5 (GHD, 2022a) Events 25 to 30 (April to September 2021)	Yes	Hardness as CaCO ₃
Report 6 (GHD, 2022b) Events 31 to 36 (October 2021 to March 2022)	Yes	Hardness as CaCO ₃ , PAH and phenols during January, February and March 2022 events
Report 7 (GHD, 2022c) Events 37 – 42 (April 2022 to September 2022)	Mostly Yes – unable to sample in April due to weather conditions.	Hardness as CaCO ₃
Report 8 (GHD, 2023a) Events 43 – 48 (October 2022 to March 2023)	Yes (however no samples collected at BH112R between December 2022 and March 2023, and BH107R in January 2023, due to access restrictions)	Hardness as CaCO ₃
Report 9 Events 49 – 54 (April 2023 to September 2023)	Yes (no samples collected at BH112R between March and July 2023, and BH107R in June 2023, due to access restrictions)	Hardness as CaCO ₃
Report 10 Events 55 – 60 (October 2023 to September 2024)	Yes	Hardness as CaCO ₃ in all events. PAH and phenols in January 2024

3.5.1 Quality assurance / quality control (QA/QC)

A review of the field and laboratory QA/QC performance from the investigation is presented in Appendix F. It is considered the analytical dataset collected during this monitoring period can be relied on for interpretation and assessment of background groundwater conditions in the vicinity of the project.

4. Assessment methodology

4.1 Data quality objectives

Data Quality Objectives (DQO) have been established for this groundwater report and are detailed in Appendix F. DQOs have been established to ensure the investigation is undertaken in a way that supports the collection and reporting of reliable data on which to base the investigation.

Data quality indicators (DQIs) have also been established to assess the usability of the data to allow decisions to be made with confidence. These are presented in Appendix F.

4.2 Basis for assessment

4.2.1 Water quality objectives

The key water quality objective of the M12 Motorway project was to determine baseline groundwater conditions within the project boundary prior to construction, supporting the development of a groundwater monitoring program and management plan during construction and operation of the project. This included forming site-specific water quality guidelines applicable for subsequent assessment. The plans and programs will likely be used to form conditions of approval under Part 5.1 of the *Environmental Planning and Assessment Act 1979*.

In order to achieve this, the framework in The Australian and New Zealand Environment Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand (ANZECC & ARMCANZ, 2000) water quality guidelines are adopted to guide the conservation of ambient water quality. These guidelines provide recommended trigger values that have been applied to understand the current health of the waterways and key indicators of concern. These guidelines should be regarded as highly conservative in relation to the current condition of the sampling locations.

4.2.2 Relevant guidelines

The framework for the contamination assessment made herein, was developed in accordance with guidelines “made or approved”, by the NSW EPA under Section 105 of the *Contaminated Land Management Act, 1997*. These guidelines include, but are not limited to the following:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ, 2000).
- Consultants Reporting on Contaminated Land: Contaminated Land Guidelines, NSW EPA (NSW EPA, 2020).
- National Environmental Protection (Assessment of Site Contamination) Amendment Measure NEPM, National Environment Protection Council, NEPC (NEPC, 2013).
- NHMRC & NRMMC (2018) Australian Drinking Water Guidelines 6, 2011 (version 3.7 updated in January 2022) (NHMRC & NRMMC, 2011).
- NSW EPA, Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997 (NSW EPA, 2015).

4.2.3 Adopted assessment criteria

To assess and understand baseline groundwater quality conditions, assessment criteria have been adopted from ANZECC & ARMCANZ, 2000 (updated in 2018), NEPM (NEPC, 2013) and NHMRC & NRMMC (2011, v3.7 updated in 2022).

GHD conducted a search of existing registered groundwater bore records in the vicinity of the project area using the Bureau of Meteorology’s Australian Groundwater Explorer (BOM, 2024); accessed 25 March 2024, and identified four non-monitoring groundwater wells within 1000 m of the project area. These groundwater wells were identified as being used for commercial/industrial use, exploration, and water supply, stock and/or domestic purposes. The health screening level (HSL) for commercial/industrial were applied (HSL D) to represent the

proposed land use. As three wells used for water extraction purposes were identified within 1000 m of the project area, the Australian Drinking Water Guidelines (ADWG) (NHMRC & NRMMC, 2011) have been selected as the screening criteria protective of human health.

Health screening levels (HSL) for petroleum hydrocarbons

The NEPM (NEPC, 2013) provides guidance relating to the assessment of vapour risks from petroleum hydrocarbons. HSLs for petroleum hydrocarbons for commercial/industrial land use (HSL D) have been adopted for the groundwater assessment to characterise the risk posed to future commercial users of the project area by potential hydrocarbon vapour intrusion.

Groundwater Investigation Levels (GIL) for human health

As previously stated, ADWG v3.7, updated in January 2022 (NHMRC & NRMMC, 2011) health criteria have been adopted as a conservative approach to characterise the risk posed to users of the project area and potential off-site drinking water users by contaminants of potential concern (CoPC) via direct contact with groundwater. Drinking water criteria were considered due to the presence of four groundwater wells located within a 1000 m radius of the project area used for non-monitoring purposes.

Ecological assessment criteria

Ecological assessment criteria for the groundwater assessment has been considered due to the close proximity of numerous fresh water bodies throughout the project area, of which there is potential for groundwater to migrate. As such, the following guidelines were adopted for the protection of local freshwater systems.

- ANZG (2018) Freshwater – 95% level of species protection (slightly to moderately disturbed systems)
- ANZECC (2000) – Lowland Rivers (NSW Coastal Rivers)
- ANZECC (2000) – Stock Watering

These criteria were selected as it is possible for plants and/or freshwater bodies to come into contact with groundwater. Assessment criteria for slightly to moderately disturbed systems was considered to be appropriate, as the project area is neither undisturbed systems of high ecological value, nor highly disturbed systems with no to low ecological value.

5. Data assessment

5.1 Field measured groundwater quality parameters

Groundwater quality parameters measured in the field during the baseline monitoring period are summarised in Table B5, Appendix B, the construction monitoring period to date in Table B6, Appendix B, and the current monitoring period in Table B7, Appendix B. The field purging sheets are included in Appendix G.

Summary statistics of field parameters for all baseline monitoring events (April 2019 – July 2022), all construction monitoring events (August 2022 to March 2024), and the current monitoring events (October 2023 to March 2024) were calculated for sampling wells BH104/BH104R, BH107/BH107R, BH112/BH112R, and BH145R. A comparison of results between BH145 and BH145R is not included as BH145 was not installed correctly. This is based on less than one metre of groundwater recorded in BH145 with water in the well suspected to be from surface runoff infiltration.

These summary statistics included the 80th percentile concentrations of the field parameters, which can be used to define site-specific conditions during the pre-construction phase of the works. These summary statistics are presented in Sections 5.1.1 to 5.1.5 below. As of Report 10 (this report), calculation and comparison of the 20th percentiles are no longer included, with exception of those for DO, EC and pH as the low 20th percentile values pose a risk. This is due to consideration that for the majority of analytes and/or parameters, the 80th percentile is the main calculation of value for comparison due to a higher concentration of the analytes being the risk driver between each phase of works and the overall purposes of the M12 water monitoring program.

It is noted that the construction period summary statistics for BH112R do not include monitoring rounds between December 2022 to July 2023 where the well was inaccessible or was not yet available for groundwater sampling as the redrilled monitoring well had not been developed.

Graphs presenting the field parameters at each location since the beginning of the monitoring program are presented in Figures 1 to 5, Appendix C. It is noted that missing data points observed in Figures 1 to 5, Appendix C, are the result of field parameters unable to be collected due to access restrictions and/or insufficient water in well locations (see Table B1, Appendix B). The box plots are provided in Appendix D.

It is noted that there are differences in field parameters and laboratory analytical results between the old wells BH104, BH107, BH112, and BH145 with their replacements BH104R, BH107R, BH112R, and BH145R.

5.1.1 Dissolved oxygen (DO)

The 20th and 80th percentile DO concentrations calculated for the current and construction monitoring periods compared to the baseline monitoring period are presented in Table 5 below. Variations in DO concentrations across sampling locations and sampling events are presented in Figure 1, Appendix C. Boxplot comparisons between baseline and construction DO concentrations are presented in Figure 1, Appendix D.

Table 5 Summary statistics for dissolved oxygen

Dissolved Oxygen (mg/L)									
Phase:	Current Monitoring Period			Construction Monitoring Period			Baseline Monitoring Period		
Site ID	N	20th %ile	80th %ile	N	20th %ile	80th %ile	N	20th %ile	80th %ile
BH104 / BH104R	6	0.000	0.120	20	0.088	2.848	34	0.372	2.058
BH107 / BH107R	6	0.630	3.630	18	0.444	4.812	31	0.670	3.530
BH112 / BH112R	6	0.240	0.960	12	0.270	4.516	29	0.558	2.926
BH145R	6	0.010	0.100	12	0.022	0.398	-	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R and BH112/BH112R: sits outside the baseline data (i.e. either below the 20th baseline percentile or above the 80th baseline percentile).

2. **BOLD** for BH145R: sits outside the construction data (i.e. either below the 20th construction percentile or above the 80th construction percentile).

The comparison of calculated percentiles for DO monitoring data in each well for the current and construction monitoring periods are summarised as follows:

- Current period:
 - BH104/BH104R: the 20th and 80th percentiles are below the 20th baseline percentile.
 - BH107/BH107R: the 20th percentile is slightly below the baseline 20th percentile and the 80th percentile is slightly above the baseline 80th percentile.
 - BH112/BH112R: the 20th percentile is below the baseline 20th percentile.
 - BH145R, the current period 20th percentile is below the construction 20th percentile.
- Construction period:
 - BH104/BH104R, BH107/BH107R and BH112/BH112R, all 20th percentiles are below the baseline 20th percentile and all 80th percentiles are above the baseline 80th percentile.

The above comparison DO monitoring data indicates that all construction period and the majority of current period 20th and 80th percentiles sit outside the baseline data for BH104/BH104R, BH107/BH107R and BH112/BH112R. Construction period measurements above the baseline in BH104/BH104R and BH107/BH107R may be attributed to increased DO results recorded since May 2023, and in BH112/BH112R, since August 2023.

5.1.2 Electrical conductivity (EC)

The 20th and 80th percentile EC concentrations calculated for the current and construction monitoring periods compared to the baseline monitoring period are presented in Table 6 below. Variations in EC concentrations across sampling locations and sampling events are presented in Figure 2, Appendix C. Boxplot comparisons between baseline and construction EC concentrations are presented in Figure 2, Appendix D.

Table 6 Summary statistics for electrical conductivity

Electrical Conductivity (µs/cm)									
Phase:	Current Monitoring Period			Construction Monitoring Period			Baseline Monitoring Period		
Site ID	N	20th %ile	80th %ile	N	20th %ile	80th %ile	N	20th %ile	80th %ile
BH104 / BH104R	6	7707	8611	20	7283	11774	34	10442	16921
BH107 / BH107R	6	3193	3457	18	2903	4074	31	4654	9375
BH112 / BH112R	6	13913	15954	12	3848	15314	29	6479	12590
BH145R	6	16065	17357	12	12508	17251	-	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R and BH112/BH112R: sits outside the baseline data (i.e. either below the 20th baseline percentile or above the 80th baseline percentile).

2. **BOLD** for BH145R: sits outside the construction data (i.e. either below the 20th construction percentile or above the 80th construction percentile).

The comparison of calculated percentiles for EC monitoring data in each well for the current and construction monitoring periods are summarised as follows:

- Current period:
 - BH104/BH104R and BH107/BH107R: the 20th percentiles are below the baseline 20th percentile.
 - BH112/BH112R: the 20th and 80th percentiles are above the baseline 80th percentile.
 - BH145R: the 80th percentile is above the construction 80th percentile.
- Construction period:
 - BH104/BH104R and BH107/BH107R: similar to the current period, the 20th percentiles are below the baseline 20th percentile.
 - BH112/BH112R: the 20th percentile is below the 20th baseline percentile and the 80th percentile is above the 80th baseline percentile.

The above comparison for EC monitoring data indicates that all current period and the majority of construction period 20th and 80th percentiles sit outside the baseline data for BH104/BH104R, BH107/BH107R and BH112/BH112R. The exceedances of the baseline percentiles in BH112/BH112R and BH145R may be attributed to the limited size of the construction period data set in comparison to BH104/BH104R and BH107/BH107R.

EC measurements in BH112/BH112R increased by an order of magnitude after the replacement well BH112R was monitored for the first time in August 2023, where these concentrations have since remained elevated. Conversely in BH104/BH104R and BH107/BH107R, EC measurements have decreased since the monitoring of replacement wells BH104R and BH107R.

5.1.3 Redox conditions

The calculated redox measurements at the 80th percentile for the current and construction monitoring periods compared to the baseline monitoring period are presented in Table 7 below. Variations in EC concentrations across sampling locations and sampling events are presented in Figure 3, Appendix C. Boxplot comparisons between baseline and construction redox concentrations are presented in Figure 3, Appendix D.

Table 7 Summary statistics for redox

Redox (mV)						
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80 th %ile	N	80 th %ile	N	80 th %ile
BH104 / BH104R	6	171.50	20	265.32	34	272.08
BH107 / BH107R	6	306.90	18	309.60	31	291.40
BH112 / BH112R	6	309.40	12	317.36	29	301.18
BH145R	6	121.00	12	123.66	-	-

- Notes:
1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.
 2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.
 3. Redox is corrected for standard hydrogen electrode (SHE) by adding 205 mV to YSI redox potential reading

Redox monitoring data from the current and construction monitoring periods indicate that 80th percentile measurements are above the baseline 80th percentile measurement in BH107/BH107R and BH112/BH112R. However, in general, it should be noted that the calculated 80th percentiles are similar in value and all redox measurements throughout the construction monitoring period and baseline period do not appear to show a trend.

5.1.4 pH

The 20th and 80th percentile pH values calculated for the current and construction monitoring periods compared to the baseline monitoring period are presented in Table 8 below. Variations in pH concentrations across sampling locations and sampling events are presented in Figure 4, Appendix C. Boxplot comparisons between baseline and construction pH concentrations are presented in Figure 4, Appendix D.

Table 8 Summary statistics for pH

pH									
Phase:	Current Monitoring Period			Construction Monitoring Period			Baseline Monitoring Period		
Site ID	N	20th %ile	80th %ile	N	20th %ile	80th %ile	N	20th %ile	80th %ile
BH104 / BH104R	6	6.66	6.78	20	6.56	6.85	34	6.20	6.70
BH107 / BH107R	6	6.97	7.20	18	6.93	7.38	31	6.57	6.91
BH112 / BH112R	6	6.55	6.79	12	6.66	6.98	29	6.45	6.71
BH145R	6	6.51	6.65	12	6.52	6.77	-	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R and BH112/BH112R: sits outside the baseline data (i.e. either below the 20th baseline percentile or above the 80th baseline percentile).

2. **BOLD** for BH145R: sits outside the construction data (i.e. either below the 20th construction percentile or above the 80th construction percentile).

The comparison of calculated percentiles for pH monitoring data in each well for the current and construction monitoring periods are summarised as follows:

- Current period and construction period:
 - BH104/BH104R and BH112/BH112R: the 80th percentiles are above the baseline 80th percentiles.
 - BH107/BH107R: the 20th and 80th percentiles are above the baseline 80th percentile.

In addition to the above comparison, for the current period in BH145R the 20th percentile is below the construction 20th percentile.

The exceedances of the baseline 80th percentile in BH104/BH104R, BH107/BH107R and BH112/BH112R may be attributed to the increasing pH concentrations across these wells which has been occurring as part of a trend since around February 2022.

5.1.5 Temperature

The 80th percentile groundwater temperature values calculated for the current and construction monitoring periods compared to the baseline monitoring period are presented in Table 9 below. Variations in pH concentrations across sampling locations and sampling events are presented in Figure 5, Appendix C. Boxplot comparisons between baseline and construction groundwater temperature concentrations are presented in Figure 5, Appendix D.

Table 9 Summary statistics for temperature

Temperature (°C)						
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80th %ile	N	80th %ile	N	80th %ile
BH104 / BH104R	6	21.1	20	19.7	34	20.1
BH107 / BH107R	6	20.6	18	19.9	31	20.2
BH112 / BH112R	6	21.9	12	21.8	29	20.2
BH145R	6	19.8	12	19.7	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.

2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.

Groundwater temperature data for the current monitoring period indicates that the current period 80th percentile is above the baseline 80th percentile in BH104/BH104R, BH107/BH107R and BH112/BH112R, and above the construction 80th percentile in BH145R. In addition, the construction 80th percentile for BH112/BH112R was above the baseline 80th percentile. In general, these exceedances are minor and may be attributed to the warmer climate over the course of the current monitoring period (October 2023 to March 2024), or the limited size of the construction data set in comparison to the baseline data set, particularly in BH112/BH112R and BH145R.

5.2 Field observations

During groundwater purging, observations of visual and olfactory characteristics of the groundwater, such as colour, turbidity, odour, and sheen, were recorded alongside SWL and water quality measurements (as presented in Table B7, Appendix B). LNAPL was not detected in any of the sampled wells during the baseline and construction monitoring periods.

As discussed in Section 6, the measured SWL at monitoring well locations were relatively consistent across the monitoring period at BH107R, some increase at BH104R and BH145R and some decrease at BH112R. As discussed in Section 5.1 and tabulated in Table B8, Appendix B, fluctuations in pH, temperature, oxidation / reduction potential, dissolved oxygen and electrical conductivity measurements were recorded across the monitoring period.

The observations for each well sampled during the current monitoring period are summarised in Table 10 below. Observations from all sampling events are provided in Tables B5 to B7, Appendix B.

Table 10 Summary of groundwater observations during current monitoring period

Well ID	Observations during current monitoring period (October 2023 to March 2024)
BH104R	Generally clear or with a yellow tinge, with no odour or sheen, though a sulphide odour was noted in January 2024.
BH107R	Generally clear, or with a pale brown or yellow tinge, no odour or sheen.
BH112R	Clear or light brown, no odour or sheen.
BH145R	Clear or grey-brown tinge, no odour or slight sulphuric odour (December 2023 and March 2024), no sheen

5.3 Laboratory analytical results

The laboratory analytical results of groundwater samples for the current monitoring period are tabulated in Table B4, Appendix B. All baseline results are tabulated in Table B2, Appendix B, and all construction results are tabulated in Table B3, Appendix B. Laboratory reports are provided in Appendix H. The analytical results of the current monitoring period were compared against relevant assessment criteria (as discussed in 4.2.3). A summary of CoPC exceedances and statistical summaries where exceedances of adopted assessment criteria occurred is presented below.

5.3.1 Major cations and anions

The major ions for each groundwater monitoring well are characterised graphically using a Piper diagram which can be used to identify whether the water quality at each location has changed over time. Piper diagrams for the baseline monitoring period are presented in Figure 1, the construction monitoring period to date in Figure 2, and the current monitoring period in Figure 3.

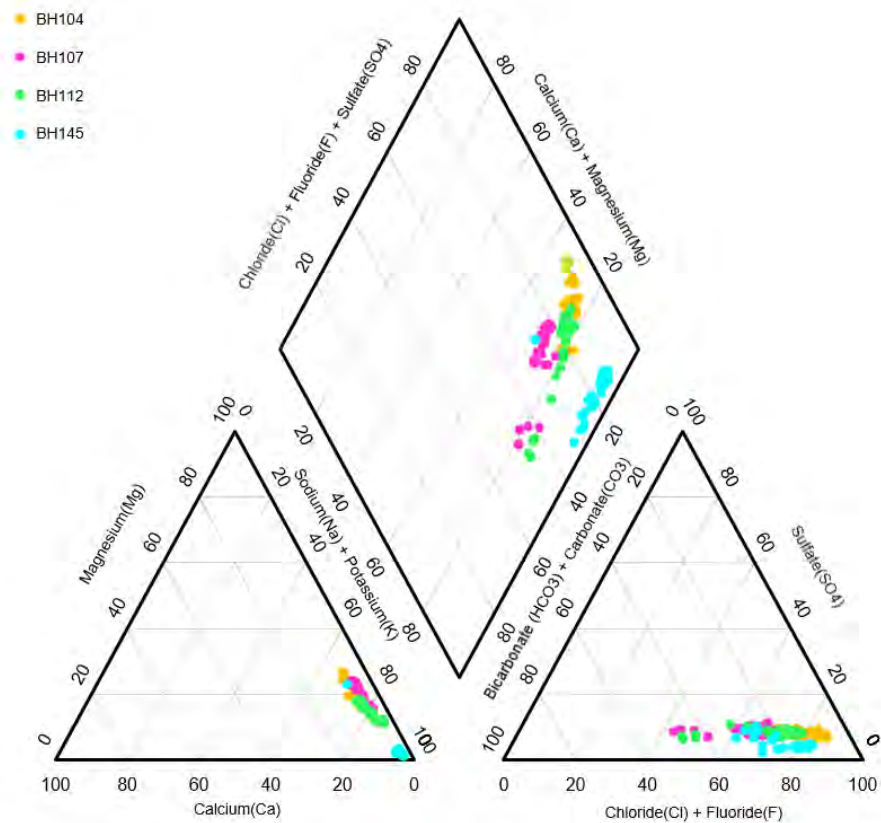


Figure 1 Piper plot for groundwater changes throughout the baseline monitoring period (July 2019 to July 2022)

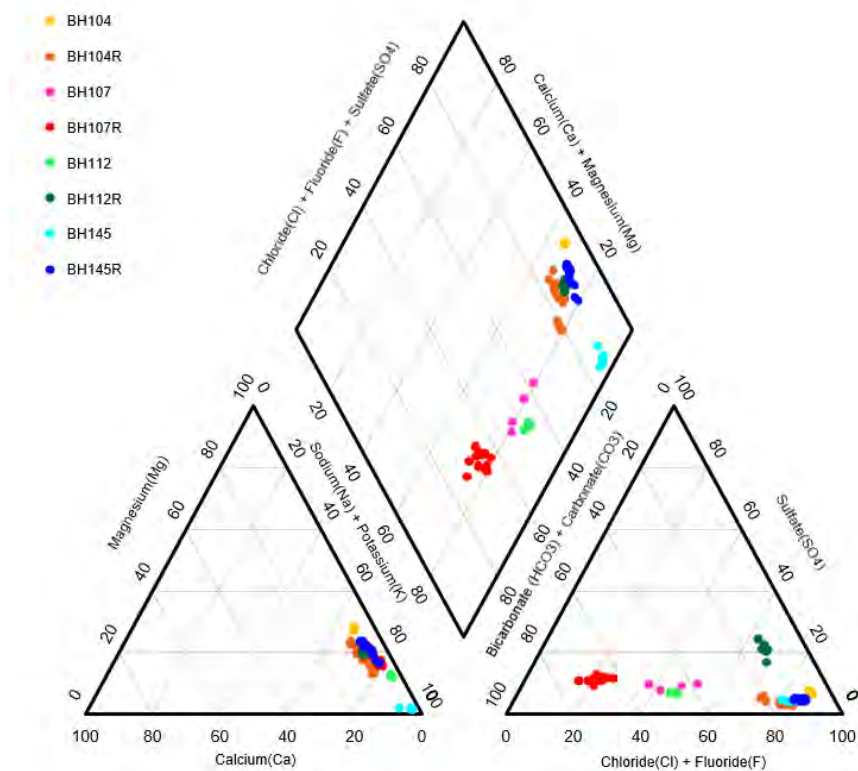


Figure 2 Piper plot for groundwater changes throughout the construction monitoring period (August 2022 to March 2024)

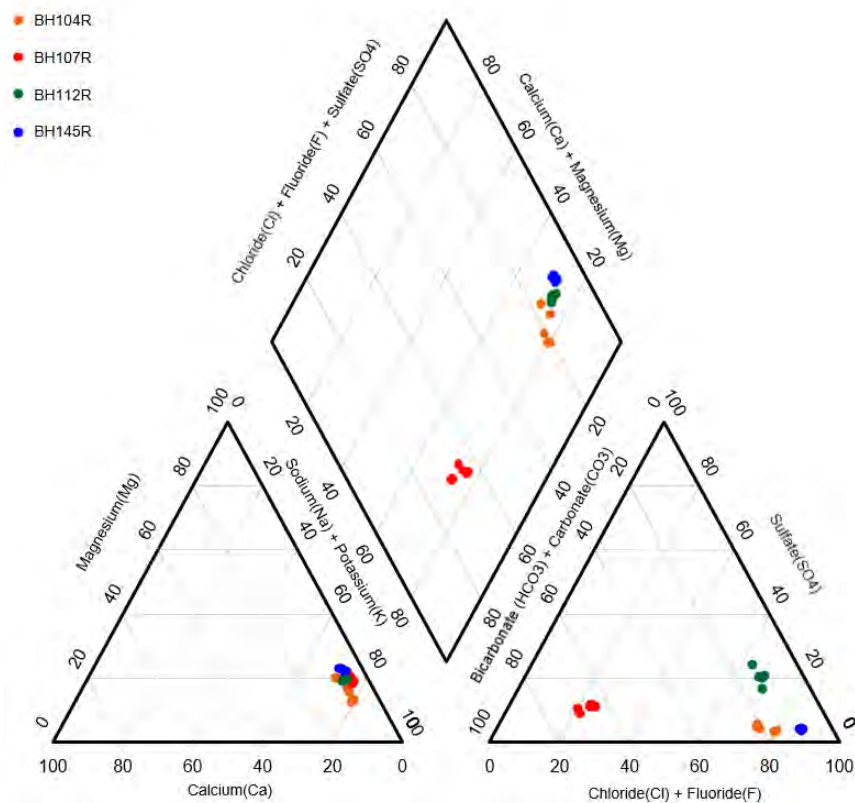


Figure 3 Piper plot for groundwater changes throughout the current monitoring period (October 2023 to March 2024)

In the baseline period, all monitoring wells recorded groundwater dominated by sodium chloride, resembling marine water composition. This may be due to the underlying shale and fluvial clay deposits (former marine origins). BH145 recorded a higher sodium chloride concentration when compared to the western wells BH104, BH107 and BH112. The western wells recorded higher calcium and magnesium concentrations when compared to eastern well BH145.

In the construction period, it can be observed from Figure 2 that major cations and anions in replacement wells are different from their original wells. In the current period, Figure 3 presents that BH104R, BH112R and BH145R recorded groundwater dominated by sodium chloride, and BH107R recorded groundwater dominated by sodium bicarbonate. In BH107R the dominant compound change between the baseline period and current period is attributable to the lower concentrations of sodium and chloride and similar bicarbonate concentration in the replacement well compared to the original well. In BH145R, major ion concentrations are considerably higher than the original well indicating a difference in groundwater chemistry.

BH107R is more indicative of freshwater than the other monitoring wells and has a varied physiochemical profile compared to the other groundwater wells, this may be due to the monitoring well installation. The installation was based on the original install for BH107, however the lithology is slightly different and the filter pack for the screen is within the unconsolidated residual soils allowing fresh water infiltration from the surface into the well. Whereas all the other monitoring wells the screen and filter packs are wholly within the consolidated bedrock.

5.3.2 Nutrients

All groundwater samples reported concentrations above the LOR for at least one nutrient compound in the current monitoring period.

Comparisons between summary statistics for nutrient concentrations in monitoring wells for sampling events throughout the baseline monitoring period (April 2019 to July 2022), the construction monitoring period (August 2022 to March 2024), and the current monitoring period (October 2023 to March 2024) are provided in Table 11 to Table 16.

Boxplots comparisons between the baseline monitoring period and the construction monitoring period for ammonia, nitrate, total oxidised nitrogen (as N), total nitrogen, and total phosphorus are provided in Figures 6 to 10, Appendix D.

Table 11 Summary statistics for ammonia

Ammonia (mg/L)						
Adopted criterion	ANZG 2018 – 95% Freshwater: 0.090 mg/L					
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80 th %ile	N	80 th %ile	N	80 th %ile
BH104 / BH104R	6	1.690	20	1.460	35	0.328
BH107 / BH107R	6	0.050	18	0.180	32	0.070
BH112 / BH112R	6	2.510	12	2.376	32	1.978
BH145R	6	2.140	12	2.110	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.
2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.

Construction and current period 80th percentiles for ammonia were above the baseline 80th percentile in BH104/BH104R and BH112/BH112R. In BH107/BH107R, only the construction 80th percentile is above the baseline 80th percentile. In BH145R, the current period 80th percentile is slightly above the construction 80th percentile.

This increase in concentrations above the baseline can be attributed to the drilling of the replacement wells. It is noted that the current period 80th percentile concentration in BH107R is similar to the baseline 80th percentile indicating that the concentration has slowly reduced over time.

Table 12 Summary statistics for nitrate

Nitrate (mg/L)						
Adopted criterion	ANZG 2018 – 95% Freshwater: 2.40 mg/L					
	ADWG 2011 – Health: 11.29 mg/L					
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80 th %ile	N	80 th %ile	N	80 th %ile
BH104 / BH104R	6	0.010	20	1.548	35	0.122
BH107 / BH107R	6	2.520	18	5.696	32	2.484
BH112 / BH112R	6	1.720	12	1.582	32	1.922
BH145R	6	0.010	12	0.010	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.
2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.

Construction period 80th percentiles for nitrate are above the baseline 80th percentile in BH104/BH104R and BH107/BH107R, with current period 80th percentile concentrations above the baseline in BH107/BH107R only. The increase in concentrations above the baseline at BH104/BH104R and BH107/BH107R for the construction period is attributed to significant increases in BH104 and BH107 between May 2022 and November 2022, with concentrations in the replacement wells significantly lower. These increases started at the end of the baseline period and therefore not attributed to the construction of the project. These lower concentrations are reflected in the statistics for the current period.

Table 13 Summary statistics for nitrite

Nitrite (mg/L)						
Adopted criterion	ADWG 2011 – Health: 11.29 mg/L					
	ANZECC 2000 – Stock Watering: 9.1 mg/L					
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80 th %ile	N	80 th %ile	N	80 th %ile
BH104 / BH104R	6	0.080	20	0.040	35	0.010
BH107 / BH107R	6	0.010	18	0.056	32	0.020
BH112 / BH112R	6	0.310	12	0.318	32	0.018
BH145R	6	0.010	12	0.010	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.
2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.

In BH104/BH104R and BH112/BH112R, current and construction period 80th percentiles are above the baseline 80th percentile. In BH107/BH107R, only the construction period 80th percentile is above the baseline 80th percentile.

Nitrite concentrations in BH104/BH104R and BH107/BH107R have been fluctuating at levels above the baseline since the beginning of the construction period. Since monitoring of the redrilled well BH112R, nitrite concentrations have been steadily decreasing from 2 mg/L (August 2023) to 0.02 mg/L (March 2024), suggesting that nitrite concentrations may eventually stabilise within baseline concentrations.

Table 14 Summary Statistics for total oxidised nitrogen

Nitrogen (Total Oxidised) (as N) (mg/L)						
Adopted criterion	ANZECC 2000 – Lowland Rivers: 0.04 mg/L					
	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80 th %ile	N	80 th %ile	N	80 th %ile
BH104 / BH104R	6	0.040	20	1.580	35	0.122
BH107 / BH107R	6	2.580	18	5.762	32	2.534
BH112 / BH112R	6	2.040	12	2.144	32	1.922
BH145R	6	0.010	12	0.010	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.
2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.

Construction period 80th percentiles for total oxidised nitrogen are above the baseline 80th percentile in BH104/BH104R, BH107/BH107R, and BH112/BH112R, with current period 80th percentile concentrations above the baseline in BH107/BH107R and BH112/BH112R.

The increase in concentrations above the baseline at BH104/BH104R and BH107/BH107R is attributed to significant increases in BH104 and BH107 between May 2022 and November 2022, with concentrations in replacement wells significantly lower. Whilst concentrations in BH104R in the current monitoring period are below the baseline, BH107R remains above the baseline. BH107R is decreasing as the 80% percentiles is half the construction and therefore a decreasing trend. Since monitoring of the redrilled well BH112R, total oxidised nitrogen concentrations have been steadily decreasing from 2.55 mg/L (August 2023) to 0.28 mg/L (March 2024), suggesting that total oxidised nitrogen concentrations may eventually stabilise within baseline concentrations.

Table 15 Summary statistics for total nitrogen

Total Nitrogen (mg/L)						
Adopted criterion	ANZECC 2000 – Lowland Rivers: 0.35 mg/L					
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80 th %ile	N	80 th %ile	N	80 th %ile
BH104 / BH104R	6	2.00	20	4.76	35	1.26
BH107 / BH107R	6	3.40	18	7.40	32	3.08
BH112 / BH112R	6	4.80	12	4.80	32	3.84
BH145R	6	2.30	12	2.28	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.
2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.

Construction and current period 80th percentiles for total nitrogen are above the baseline 80th percentile in BH104/BH104R, BH107/BH107R, and BH112/BH112R. Current period 80th percentile concentrations are above the construction 80th percentile at BH145R.

The increase in construction period concentrations above the baseline at BH104/BH104R and BH107/BH107R is attributed to significant increases in BH104 and BH107 between May 2022 and November 2022, with concentrations in replacement wells significantly lower. However, BH104R and BH107R in the current monitoring period remain above the baseline. Since monitoring of the redrilled well BH112R, total nitrogen concentrations have been steadily decreasing.

Table 16 Summary statistics for total phosphorus

Total Phosphorus (mg/L)						
Adopted criterion	ANZECC 2000 – Lowland Rivers: 0.025 mg/L					
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80 th %ile	N	80 th %ile	N	80 th %ile
BH104 / BH104R	6	0.140	20	0.180	35	0.108
BH107 / BH107R	6	0.100	18	0.136	32	0.222
BH112 / BH112R	6	0.230	12	0.386	32	0.432
BH145R	6	0.080	12	0.106	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.
2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.

Construction and current period 80th percentiles for total phosphorus are above the baseline 80th percentile in BH104/BH104R. The increase in construction period concentrations above the baseline at BH104/BH104R is attributed to increases recorded since monitoring began in the replacement well. Since monitoring of the redrilled well BH112R, total phosphorus concentrations have been steadily decreasing.

5.3.3 Metals

Comparisons between summary statistics for metal concentrations in monitoring wells for sampling events throughout the baseline monitoring period (April 2019 to July 2022), the construction monitoring period (August 2022 to March 2024), and current monitoring period (October 2023 to March 2024) are provided in Table 17 to Table 26. Boxplot comparisons between the baseline monitoring period and the construction monitoring period for copper and manganese are provided in Figures 11 and 12, Appendix D.

Table 17 Summary statistics for arsenic

Arsenic (mg/L)						
Adopted criterion	ADWG 2011 – Health: 0.01 mg/L					
	ANZG 2018 – 95% Freshwater: 0.013 mg/L					
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80 th %ile	N	80 th %ile	N	80 th %ile
BH104 / BH104R	6	0.003	20	0.003	35	0.001
BH107 / BH107R	6	0.001	18	0.001	32	0.001
BH112 / BH112R	6	0.008	12	0.010	32	0.001
BH145R	6	0.003	12	0.011	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.
2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.

Table 18 Summary statistics for cadmium

Cadmium (mg/L)						
Adopted criterion	ADWG 2011 – Health: 0.002 mg/L					
	ANZG 2018 – 95% Freshwater: 0.0002 mg/L					
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80 th %ile	N	80 th %ile	N	80 th %ile
BH104 / BH104R	6	0.0001	20	0.0001	35	0.0001
BH107 / BH107R	6	0.0001	18	0.0001	32	0.0001
BH112 / BH112R	6	0.0001	12	0.0001	32	0.0001
BH145R	6	0.0001	12	0.0001	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.
2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.

Table 19 Summary statistics for chromium

Chromium (mg/L)						
Adopted criterion	ANZG 2018 – 95% Freshwater: 0.001 mg/L					
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80 th %ile	N	80 th %ile	N	80 th %ile
BH104 / BH104R	6	0.001	20	0.001	35	0.001
BH107 / BH107R	6	0.001	18	0.001	32	0.001
BH112 / BH112R	6	0.001	12	0.001	32	0.001
BH145R	6	0.001	12	0.001	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.
2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.

Table 20 Summary statistics for copper

Copper (mg/L)						
Adopted criterion	ANZG 2018 – 95% Freshwater: 0.0014 mg/L					
	ADWG 2011 – Health: 2 mg/L					
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80 th %ile	N	80 th %ile	N	80 th %ile
BH104 / BH104R	6	0.0010	20	0.0072	35	0.0276
BH107 / BH107R	6	0.0040	18	0.0050	32	0.0324
BH112 / BH112R	6	0.0090	12	0.0084	32	0.0328
BH145R	6	0.0010	12	0.0010	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.
2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.

Table 21 Summary statistics for iron

Iron (mg/L)						
Adopted criterion	None					
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80 th %ile	N	80 th %ile	N	80 th %ile
BH104 / BH104R	6	1.40	20	1.34	24	1.05
BH107 / BH107R	6	0.05	18	0.05	23	0.16
BH112 / BH112R	6	0.05	12	0.05	23	0.18
BH145R	6	3.65	12	4.42	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.
2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.

Table 22 Summary statistics for lead

Lead (mg/L)						
Adopted criterion	ANZG 2018 – 95% Freshwater: 0.0034 mg/L					
	ADWG 2011 – Health: 0.01 mg/L					
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80 th %ile	N	80 th %ile	N	80 th %ile
BH104 / BH104R	6	0.001	20	0.001	35	0.001
BH107 / BH107R	6	0.001	18	0.001	32	0.001
BH112 / BH112R	6	0.001	12	0.001	32	0.001
BH145R	6	0.001	12	0.001	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.
2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.

Table 23 Summary statistics for manganese

Manganese (mg/L)						
Adopted criterion	ANZG 2018 – 95% Freshwater: 1.9 mg/L					
	ADWG 2011 – Health: 0.5 mg/L					
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80 th %ile	N	80 th %ile	N	80 th %ile
BH104 / BH104R	6	0.1580	20	0.2570	24	0.6990
BH107 / BH107R	6	0.0250	18	0.0878	23	0.5016
BH112 / BH112R	6	0.1140	12	0.1324	23	0.2658
BH145R	6	0.1850	12	0.4656	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.
2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.

Table 24 Summary statistics for mercury

Mercury (mg/L)						
Adopted criterion	ANZG 2018 – 95% Freshwater: 0.0006 mg/L					
	ADWG 2011 – Health: 0.001 mg/L					
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80 th %ile	N	80 th %ile	N	80 th %ile
BH104 / BH104R	6	0.0001	20	0.0001	35	0.0001
BH107 / BH107R	6	0.0001	18	0.0001	32	0.0001
BH112 / BH112R	6	0.0001	12	0.0001	32	0.0001
BH145R	6	0.0001	12	0.0001	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.
2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.

Table 25 Summary statistics for nickel

Nickel (mg/L)						
Adopted criterion	ANZG 2018 – 95% Freshwater: 0.011 mg/L					
	ADWG 2011 – Health: 0.02 mg/L					
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80 th %ile	N	80 th %ile	N	80 th %ile
BH104 / BH104R	6	0.0010	20	0.0084	35	0.1054
BH107 / BH107R	6	0.0050	18	0.0038	32	0.0696
BH112 / BH112R	6	0.0090	12	0.0146	32	0.1162
BH145R	6	0.0010	12	0.0186	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.
2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.

Table 26 Summary statistics for zinc

Zinc (mg/L)						
Adopted criterion	ANZG 2018 – 95% Freshwater: 0.008 mg/L					
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80 th %ile	N	80 th %ile	N	80 th %ile
BH104 / BH104R	6	0.0060	20	0.0128	35	0.0962
BH107 / BH107R	6	0.0180	18	0.0156	32	0.0848
BH112 / BH112R	6	0.0170	12	0.0186	32	0.1276
BH145R	6	0.0050	12	0.0058	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.

2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.

Current and construction period 80th percentiles for the majority of metals were below the baseline 80th percentile, with the exception of the following:

- Arsenic: current and construction period 80th percentile concentrations were reported above the baseline in BH104/BH104R and BH112/BH112R. This may be attributable to increased concentrations coinciding with the monitoring of the replacement wells, where arsenic concentrations in BH112R and BH145R have been steadily decreasing since first being monitored.
- Iron: current and construction 80th percentile concentrations were reported above the baseline in BH104/BH104R. This may be attributed to higher concentrations recorded since the installation of BH104R, with concentrations since the monitoring of replacement wells below the maximum recorded concentrations in the baseline period.

The majority of groundwater samples collected during the current monitoring period reported heavy metal concentrations below the LOR and/or adopted assessment criteria. The reported concentrations and exceedances are discussed below.

- **Arsenic (filtered):** The majority of groundwater samples reported arsenic concentrations below the adopted criteria with exception of BH112R which reported a concentration above the human health (0.01 mg/L) criteria in October 2023. Concentrations remained below the stock watering criteria.
- **Cadmium (filtered):** All groundwater samples reported cadmium concentrations below the laboratory LOR (0.0001 mg/L) and adopted criteria.
- **Chromium (filtered):** All groundwater samples reported chromium concentrations below the LOR (0.001 mg/L) and the adopted criteria, with the exception of BH145R which reported a concentration of 0.002 mg/L in duplicate sample GWDUP1 in December 2023, which is above the ANZG ecological criterion (0.001 mg/L). It is noted that the primary sample at BH145R in December 2023 reported a chromium concentration below the LOR. Concentrations remained below the stock watering criteria.
- **Copper (filtered):** Exceedances of the adopted ANZG ecological criterion (0.0014 mg/L) for copper were reported in the following groundwater samples:
 - BH104R in November 2023 (0.002 mg/L).
 - BH107R in all events (maximum 0.007 mg/L).
 - BH112R in all events except December 2023 (maximum 0.016 mg/L).

All other concentrations remained below or equal to the LOR. All reported concentrations remained below human health and stock watering criteria.

- **Iron (filtered):** All groundwater samples in BH104R and BH145R for the current monitoring period reported iron concentrations above the LOR and BH107R and BH112R were below the LOR. The maximum concentration reported was in BH145R in October 2023 (4.03 mg/L). There are no adopted assessment criteria for iron.
- **Lead (filtered):** All groundwater samples reported lead concentrations below the LOR (0.001 mg/L), and below all adopted criteria.

- **Manganese (filtered):** All groundwater samples reported manganese concentrations above the LOR. The maximum concentration reported was in BH145R in October 2023 (0.249 mg/L). There were no exceedances of the human health or ecological criterion.
- **Mercury (filtered):** All groundwater samples reported mercury concentrations below the LOR (0.0001 mg/L) and all adopted assessment criteria.
- **Nickel (filtered):** All groundwater samples in BH112R, the majority of groundwater samples in BH107R, and less than half of the groundwater samples in BH104R and BH145R reported nickel concentrations at or above the LOR (0.001 mg/L). The following locations reported concentrations above the adopted human health (0.02 mg/L) and/or ANZG ecological (0.011 mg/L) assessment criteria:
 - BH104R in October 2023 (0.023 mg/L).
 - BH112R in October 2023 (0.016 mg/L).
 - BH145R in October 2023 (0.022 mg/L).

All reported concentrations were below the stock watering criteria.
- **Zinc (filtered):** The following samples reported concentrations above the ANZG ecological criterion (0.008 mg/L).
 - BH104R in October 2023 (maximum 0.023 mg/L)
 - BH107R in October and November 2023, February and March 2024 (maximum 0.018 mg/L)
 - BH112R in all events (maximum 0.048 mg/L)
 - BH145R in October 2023 (0.023 mg/L)

5.3.4 Hardness

(ANZECC & ARMCANZ, 2000) stated that the toxicity of certain heavy metals in freshwater reduces with increasing hardness. As such, hardness-modified trigger values (HMTV) were derived for selected metals exceeding ecological criteria (cadmium, chromium, lead, nickel and zinc) during the baseline and current monitoring period using guidance by ANZECC & ARMCANZ (2000). This provides a more accurate assessment of risk to ecological receptors. It is noted that HMTV algorithms are not able to be applied to iron and manganese.

Exceedances of adopted criteria were eliminated following the application of HMTVs for cadmium, chromium, lead, nickel and zinc, with the exceptions summarised in Table 27. No exceedances were detected during the current monitoring period (October 2023 to March 2024). Exceedances still exist as copper HMTV are not able to be derived by this method.

Table 27 Exceptions to exceedances of adopted criteria following application of HMTVs

Metal	Well ID	Events
Chromium	BH145	January 2021
Nickel	BH104R/BH104R	March 2022
	BH107/BH107R	March 2022
	BH112/BH112R	May 2021 March 2022
	BH145	September 2020 November 2020 December 2020 March 2021
Zinc	BH107/BH107R	December 2021 January 2022 March 2023
	BH112/BH112R	December 2021
	BH145	All monitoring events between September 2020 and February 2023, with the exception of October 2021

This indicates that the toxicity of metals within all groundwater monitoring wells is being reduced due to the presence of hard water during the current monitoring round. It is noted that continual exceedances of the zinc HMTV at BH145 were eliminated once BH145R was installed and monitored from April 2023.

Hardness-modified trigger values and associated heavy metal concentrations for all monitoring events are presented in Table B8, Appendix B.

5.3.5 Benzene, toluene, ethylbenzene, xylene, naphthalene (BTEXN)

All groundwater samples collected in the current monitoring period reported concentrations of BTEXN below the laboratory LOR and adopted criteria.

5.3.6 Total recoverable hydrocarbons (TRH)

All groundwater samples collected in the current monitoring period reported concentrations of TRH below the laboratory LOR and adopted criteria.

5.3.7 Polycyclic aromatic hydrocarbons (PAHs)

One monitoring round (January 2023) undertook analysis for PAHs to confirm that there are no detections of the analytical suite. All groundwater samples at the four monitoring wells collected reported concentrations of PAHs were below the LOR and adopted criteria.

5.3.8 Speciated phenols

One monitoring round (January 2023) undertook analysis for PAHs to confirm that there are no detections of the analytical suite. All groundwater samples at the four monitoring wells collected reported concentrations of phenols were below the LOR and adopted criteria.

5.3.9 Total suspended solids (TSS)

All groundwater samples reported TSS concentrations above the laboratory LOR of 5 mg/L for total suspended solids (TSS) and the adopted lowland rivers criterion (ANZECC, 2000). This parameter has been analysed from July 2020 onwards. Table 28 presents the maximum and average concentrations of TSS over the baseline monitoring period (July 2020 to July 2022), compared to the construction monitoring period (August 2022 to March 2024), and current monitoring period (October 2023 to March 2024) for each monitoring well.

Table 28 Maximum and average concentration of total suspended solids in monitoring wells

Total Suspended Solids (mg/L)						
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	Maximum	Average	Maximum	Average	Maximum	Average
BH104 / BH104R	142	109	405	132	219	48
BH107 / BH107R	496	171	1890	270	1910	271
BH112 / BH112R	123	72	2710	764	8780	937
BH145R	115	60	288	86	-	-

Average concentrations were above the baseline average for the current monitoring period in BH104R only, with groundwater well BH107R reporting higher maximum and average concentrations than other monitoring wells. The highest concentration in the current monitoring period was reported in BH07R in November 2023 (496 mg/L).

Comparisons between summary statistics for TSS concentrations in monitoring wells for sampling events throughout the baseline monitoring period, the construction monitoring period, and the current monitoring period (October 2023 to March 2024) are provided in Table 29.

Table 29 Summary statistics for total suspended solids

Total Suspended Solids (mg/L)						
Adopted criterion	ANZECC 2000 – Lowland Rivers (NSW coastal rivers): 6 mg/L					
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80 th %ile	N	80 th %ile	N	80 th %ile
BH104 / BH104R	6	135	20	159	24	61
BH107 / BH107R	6	208	18	268	23	275
BH112 / BH112R	6	77	12	1636	23	726
BH145R	6	99	12	109	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.

2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.

Construction period 80th percentiles for BH104/BH104R and BH112/BH112R, and BH145/145R exceed the baseline period 80th percentiles for TSS, with the current period 80th percentile at BH104/BH104R also above the baseline.

Construction period exceedances above the baseline at BH104/BH104R are attributed to increased concentrations in replacement well BH104R compared to BH104. TSS concentrations in BH104/BH104R since reinstatement have fluctuated between 100 mg/L and 405 mg/L. Exceedances above the baseline at BH112/BH112R can be attributed to increased concentrations between June 2022 and January 2023, with concentrations in the replacement well significantly lower. The current period 80th percentile for BH145R is consistent with the construction period 80th percentile at this location.

5.3.10 Total Dissolved Solids (TDS)

All samples in the current monitoring period reported TDS concentrations above the laboratory LOR (10 mg/L). Ecological and human health criteria are generally not applied to total dissolved solids as it is an aesthetic issue; however, the ADWG (NHMRC & NRMCC, 2011) states that concentrations exceeding 1200 mg/L are regarded as unacceptable drinking water. All samples exceeded this limit. Table 29 presents the maximum and average concentrations of TDS over the baseline monitoring period (July 2020 to July 2022), compared to the construction monitoring period (August 2022 to March 2024), and current monitoring period (October 2023 to March 2024) for each monitoring well.

Table 30 Maximum and average concentration of total dissolved solids in monitoring wells

Total Dissolved Solids (mg/L)						
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	Maximum	Average	Maximum	Average	Maximum	Average
BH104 / BH104R	5450	5073	16500	7178	15400	8374
BH107 / BH107R	3010	2412	3200	2426	6360	4753
BH112 / BH112R	11400	10575	11400	7645	8470	6093
BH145R	14500	12133	14500	10018	-	-

Groundwater concentrations at BH145R and BH112R reporting higher maximum and average concentrations an order of magnitude higher than BH104R and BH107R. The highest concentration in the current monitoring period was reported in BH145R in August 2023 (14,500 mg/L).

Table 31 Summary statistics for total dissolved solids

Total Suspended Solids (mg/L)						
Adopted criterion	ANZECC 2000 – Lowland Rivers (NSW coastal rivers): 6 mg/L					
Phase:	Current Monitoring Period		Construction Monitoring Period		Baseline Monitoring Period	
Location ID	N	80 th %ile	N	80 th %ile	N	80 th %ile
BH104 / BH104R	6	5170	20	7432	24	9778
BH107 / BH107R	6	2550	18	2956	23	6210
BH112 / BH112R	6	11100	12	10680	23	8290
BH145R	6	13300	12	11900	-	-

Notes: 1. **BOLD** for BH104/BH104R, BH107/BH107R, BH112/BH112R: sits above the baseline data for the 80th baseline percentile.
2. **BOLD** for BH145R: sits above the construction data for the 80th construction percentile.

Current and construction period 80th percentiles are above the baseline 80th percentile in BH112/BH112R. In BH145R, the current 80th percentile is above the construction 80th percentile.

Exceedances above the baseline in the construction period for BH112/BH112R are attributed to increased TDS concentrations recorded between May 2022 and November 2022, with concentrations reducing after the monitoring of replacement well BH112R in August 2023.

6. Groundwater level monitoring

6.1 Schedule of groundwater well locations

As defined in C71, addendum 2 of the GHD proposal (GHD, 2021c), GHD would monitor groundwater levels from the four groundwater sampling locations (BH104, BH107, BH112, BH145) on a monthly basis and twenty-five existing groundwater monitoring wells on a bimonthly basis (every second month) during the construction monitoring phase. Newly installed sampling wells BH104R, BH107R, BH112R, and BH145R are monitored monthly during the construction phase, depending on accessibility, as the original four wells have been decommissioned. Groundwater level monitoring is conducted manually using a dip-meter and using water level meters (WLM) installed in the wells. Some wells could not be monitored for groundwater level due to inaccessible wells, destroyed wells, or damaged WLMs.

The schedule of wells required to be sampled is listed in Table 32 below, and notes if the scheduled wells were successfully monitored. Remaining groundwater wells have water level meters (WLM) mounted to the underside of the well caps unless noted in the Table. This ensures data processing is as accurate as possible.

Table B1, Appendix B identifies the wells successfully gauged and wells that were not monitored due to inaccessibility or decommissioning, including the month they were last gauged.

Table 32 Schedule of M12 groundwater level wells monitored by GHD from August 2022 to March 2024

Installed by	Well ID	Package	RL (m, AHD)	Manual gauging data	WLM data	Well Status
JAJV	BH102	West	92.19	No	No	Destroyed
JAJV	BH104	West	101.11	No	No	Destroyed
JBS&G	BH104R	West	100.269	Yes	Yes	Monitoring Well
JAJV	BH105	West	92.7	No	No	Destroyed
JAJV	BH107	West	94.63	No	No	Destroyed
JBS&G	BH107R	West	95.566	Partial	Yes	Monitoring Well
JAJV	BH112	West	93.78	No	No	Destroyed
ADE	BH112R	West	93.663	Partial	Partial	Monitoring Well
JAJV	BH117	West	65.05	No	No	Destroyed
JAJV	BH119	West	54.0	No	No	Destroyed
JAJV	BH129	Central	49.12	No	No	Destroyed
JAJV	BH134	Central	57.94	No	No	Destroyed
JAJV	BH135	Central	60.55	No	No	Destroyed
JAJV	BH139	Central	101.1	No	No	Destroyed
JAJV	BH144	Central	113.5	No	No	Destroyed
JAJV	BH145	Central	116.3	No	No	Destroyed
MMGEO	BH145R	Central	113.153	Yes	Yes	Monitoring Well
JAJV	BH150	Central	109.5	No	No	Destroyed
JAJV	BH155	East	121.6	Yes	No ¹	Destroyed
JAJV	BH162	East	118.62	Yes	Yes	Destroyed after Oct 23
JAJV	BH170	East	92.41	No	No	Unable to locate
JAJV	BH175	East	80.34	Yes	No	Gauging Well
JAJV	BH202	West	49.53	No	No	Destroyed

Installed by	Well ID	Package	RL (m, AHD)	Manual gauging data	WLM data	Well Status
JAJV	BH204	West	50.24	No	No	Destroyed
JAJV	BH207	West	40.03	No	No	Destroyed
JAJV	BH209	West	39.36	No	No	Destroyed
JAJV	BH211	Central	37.72	No	No	Destroyed
JAJV	BH215	Central	37.77	No	No	Destroyed
JAJV	BH217	Central	40.49	No	No	Destroyed
JAJV	BH219	Central	44.46	Yes	Yes	Gauging Well
JAJV	BH221	Central	45.24	No	No	Destroyed
JAJV	BH223	Central	46.26	No	No	Destroyed
JAJV	BH227	Central	Unknown	No	No	Destroyed

¹ BH155 did not have a logger as it was dry

6.2 Data collection and analysis methodology

The methodology to collect the groundwater level data is indicatively as follows:

1. Remove gatic cover and well cap. The WLM is removed from the groundwater well during this process.
2. A manual reading of the standing water level is collected using a calibrated interface probe (IP). This is done to ensure reliability of the data collected with the WLM. Measurements are taken to the nearest millimetre.
3. The data from the WLM is then downloaded to the commercially available relevant computer software package "HOBOWare Pro", "Levellogger" or "Win-Situ". The data is collected as absolute pressure (kPa).
4. WLM is replaced into the groundwater well and gatic cover secured.
5. Data is then processed against the atmospheric pressure data and converted to 1 meter of water column (mH₂O). It is then plotted against groundwater well RL and plotted.

6.3 Manual gauging

Manual gauging results reported during the current monitoring period (October 2023 to March 2024) are presented in Table B9, Appendix B.

Depth to groundwater for the current monitoring period (October 2023 to March 2024) ranged between 81.552 m AHD (BH112R, March 2024) and 101.893 m AHD (BH145R, January 2024) in the four monitoring wells.

Groundwater elevation to Australian Height Datum (AHD) is lowest at BH112R and highest at BH104R for the group of monitoring wells BH104/BH104R, BH107/BH107R and BH112/BH112R. These wells are located on a linear alignment and therefore triangulation for groundwater flow is unable to be determined. However, based on the local topography the groundwater flow is likely to flow in a north-east direction. BH145R is located east of the other wells and there are no other wells nearby to determine groundwater flow. However, based on the local topography groundwater is likely to flow towards the south in this area.

The approximate groundwater elevation of the gauging wells with results from the current monitoring round are plotted in Appendix I.

Groundwater levels obtained by manual reading across the monitoring and gauging wells throughout the current monitoring period are summarised as follows:

- BH104R: increased by approximately 0.74 m.
- BH107R: remained relatively stable.
- BH112R: decreased by approximately 0.44 m.
- BH145R: increased by approximately 0.49 m.

6.4 Results

Manual gauging data is presented in Table B9, Appendix B, and groundwater level plots are presented in Appendix I.

The groundwater level monitoring results are presented on RL vs time plots. A secondary axis shows daily rainfall data downloaded from the Bureau of Meteorology website for the Badgerys Creek AWS Station (ID 067108) which is located approximately 4 km southeast of the western project area (BH104/BH104R, BH107/BH107R and BH112/BH112R) and approximately 9 km west of the eastern project area (BH145/BH145R). Where there are gaps in rainfall data as the Badgerys Creek Station is offline, rainfall data from Horsley Park (ID 067119) and Rossmore (ID 67601) stations are used. It is noted that for the current monitoring period seven wells have WLM data within the current monitoring period (October 2023 to March 2024). The remaining wells, as outlined in Table 32, have either been destroyed or were inaccessible, as noted in Table B1, Appendix B.

In the western area, only the groundwater quality monitoring wells remain out of all gauging wells. The groundwater levels in these wells are summarised as follows:

- BH104R steadily decreased from December 2022 to July 2023, and between July 2023 and August 2023, the water level dropped approximately 1.2 m. Between August 2023 and November 2023, the water level remained relatively stable and has been slightly increasing with an increase of approximately 0.6m from November 2023 to March 2024.
- BH107R remained relatively stable though with a very slight decrease (less than 0.1 m), continuing an overall decreasing trend observed in BH107R since it was installed in December 2022. Water levels in BH107R remained above screen throughout the current monitoring period, with the exception of a short time period after all monitoring events where purging for groundwater monitoring had been undertaken.
- BH112R has slightly decreased, with a change in water level of less than one metre from the first measurement in August 2023 to the most recent measurement in March 2024.

In the central area, water levels in replacement well BH145R remained relatively stable over the current monitoring period. BH145, which was decommissioned in April 2023, only had a small amount of water column within the well when monitored during previous monitoring rounds and had slow to no recharge once the water was removed and, therefore, the groundwater levels in BH145 are not indicative of the surrounding area. Gauging well BH219 remained relatively stable throughout the monitoring period. All other gauging wells in the central area have been destroyed.

In the eastern area, water levels in wells BH162 and BH175 have a slight decreasing trend in height, dropping less than 1m during the monitoring period, continuing an overall decreasing trend since September 2022. However, the water levels in both wells are still within range of the historical water levels recorded since May 2019 to present and coincide with a decreasing trend in rainfall across the project area. BH162 was destroyed in December 2023, and BH170 was unable to be located. All other gauging wells in the eastern area have been destroyed.

7. Conclusions

The measured groundwater quality parameters and the project analytical suite have provided further data to incorporate into the construction monitoring period percentile values. The reported concentration of analytes in the current monitoring period are broadly consistent with those reported in the baseline monitoring period, with noted increases in nutrients and metals concentrations. These increases have occurred with the replacements of the monitoring wells and therefore no management actions are required cumulating from this monitoring period.

The data reported in the redrilled monitoring wells of BH104R, and BH107R, BH112R, and BH145R are not similar to the original monitoring wells data (both for construction and baseline) and therefore a full comparison of the dataset has not been provided.

8. References

- ANZECC & ARMCANZ. (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Canberra: Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ).
- ANZECC. (2000). *Criteria for lowland rivers (NSW coastal rivers)*.
- ANZG. (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Available at www.waterquality.gov.au/anz-guidelines. Canberra ACT, Australia: Australian and New Zealand Governments and Australian state and territory governments,.
- BOM. (2024). Australian Groundwater Explorer. Bureau of Meteorology. Retrieved from Australian Groundwater Explorer: <http://www.bom.gov.au/water/groundwater/explorer/>
- BOM. (2024). *Climate Data Online Long-term Rainfall and Temperature - Station ID 067108*. Bureau of Meteorology.
- CPB Georgiou JV. (2023). Appendix C Construction Soil and Water Monitoring Program M12 Motorway West April 2023 Rev 01. *Construction Environmental Management Plan Appendix B8 Construction Soil and Water Management Sub-plan M12 Motorway West April 2023 Rev 01*.
- DPI. (2014, April). Water for livestock: interpreting water quality tests. Department of Primary Industries.
- Geological Survey of NSW. (1991). *Penrith 1:100,000 Geological Series Sheet 9030*.
- GHD. (2015). *Standard Operating Procedure (SOP) for groundwater well sampling*.
- GHD. (2019). *M12 Motorway Groundwater Monitoring Six Monthly Report 1 - April to September 2019*.
- GHD. (2020). *M12 Motorway Groundwater Monitoring Report 2 – April 2019 to March 2020*.
- GHD. (2021a). *M12 Motorway Groundwater Monitoring Six Monthly Report 3 - April to September 2020*.
- GHD. (2021a). *M12 Motorway Groundwater Monitoring Six Monthly Report 3 - April to September 2020*.
- GHD. (2021b). *M12 Motorway Groundwater Monitoring Six Monthly Report 4 - October 2020 to March 2021*.
- GHD. (2021c). *Development - Western Parkland City M12 Motorway Project. Water quality and level monitoring services. Contract number 20.0000303606.0590*.
- GHD. (2022a). *M12 Motorway Groundwater Monitoring Report 5 – April 2021 to September 2021*.
- GHD. (2022b). *M12 Motorway Groundwater Monitoring, Report 6 - October 2021 to March 2022. Transport for NSW*.
- GHD. (2022c). *M12 Motorway Groundwater Monitoring Six Monthly Report 7 - April to September 2022*.
- GHD. (2023a). *M12 Motorway Groundwater Monitoring Six Monthly Report 8 - October 2022 to March 2023*. Sydney: GHD Pty Ltd.
- GHD. (2024). *M12 Motorway Groundwater Monitoring Six Monthly Report 9 - April 2023 to September 2023*. Sydney: GHD Pty Ltd.
- JAJV. (2018a). *M12 Motorway Concept Design and Environmental Impact Statement: Surface Water and Hydrology Assessment Report. Report prepared for Roads and Maritime Services by Jacobs Arcadis Joint Venture*. Sydney, NSW.
- JAJV. (2018b). *M12 Motorway Concept Design and Environmental Impact Statement: Contamination Factual Report. Report prepared for Roads and Maritime Services by Jacobs Arcadis Joint Venture*. Sydney, NSW.
- JAJV. (2018c). *M12 Motorway Concept Design and Environmental Impact Statement: Groundwater Assessment. Report prepared for Roads and Maritime Services by Jacobs Arcadis Joint Venture*. Sydney, NSW.
- JAJV. (2019). *M12 Motorway Concept Design and Environmental Impact Statement - Groundwater quality and hydrology assessment report. Report prepared for Roads and Maritime Services by Jacobs Arcadis Joint Venture*.
- JAJV. (2019). *M12 Motorway Environmental Impact Statement. Report prepared for Roads and Maritime Services by Jacobs Arcadis Joint Venture*. Sydney NSW.
- NEPC. (2013). *National Environmental Protection (Assessment of Site Contamination) Measure (ASC NEPM)*. National Environmental Protection Council (NEPC).
- NEPC. (2013). *National Environmental Protection (Assessment of Site Contamination) Measure*. National Environment Protection Council.
- NHMRC & NRMCC. (2011). *Australian Drinking Water Guidelines 6 (version 3.5 updated in August 2018) - Health and Recreation criteria*.
- NSW EPA. (2015). *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997*.
- NSW EPA. (2020). *Consultants Reporting on Contaminated Land Guidelines: Contaminated Land Guidelines*. Parramatta: NSW Environment Protection Authority (EPA).

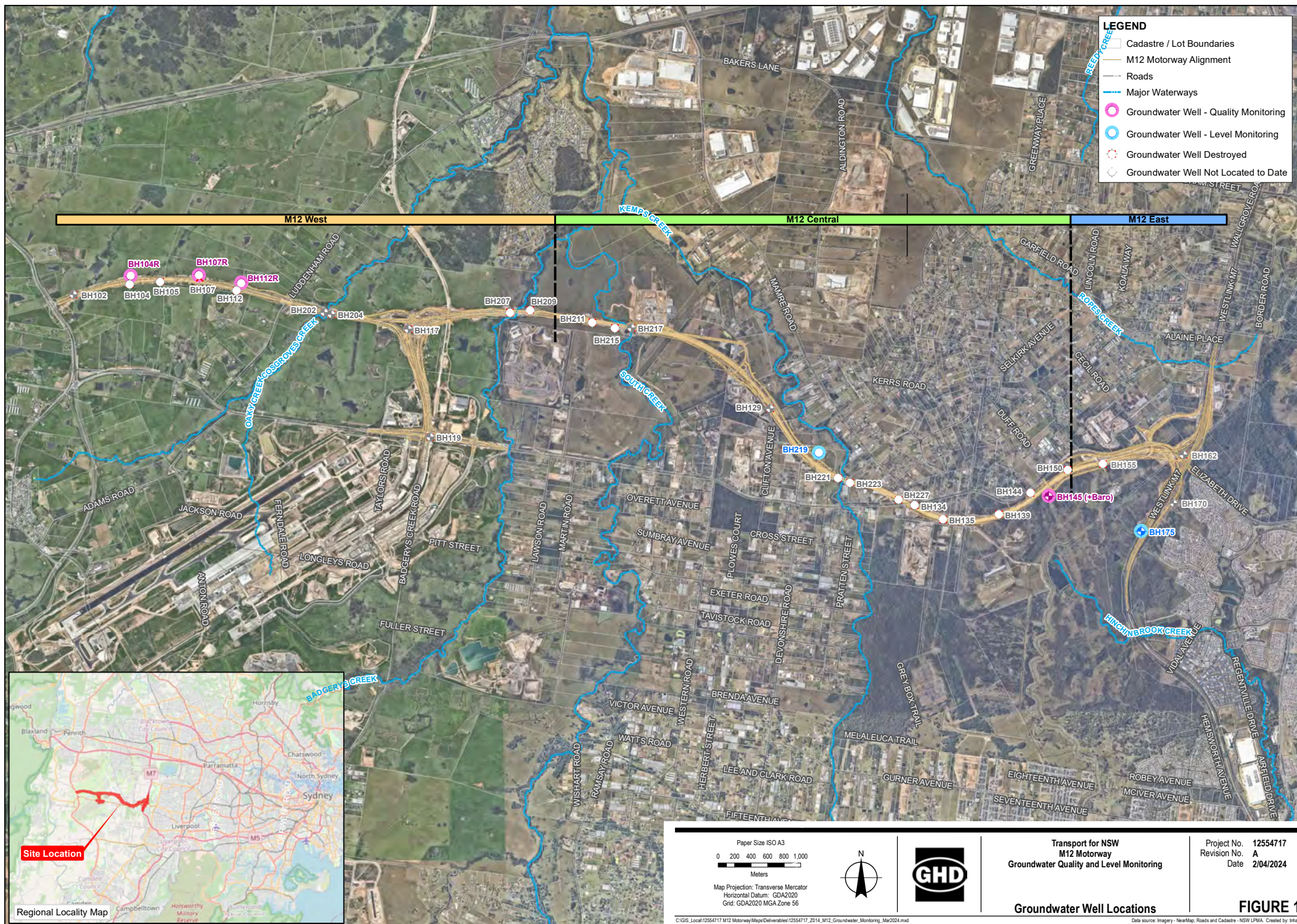
Seymour Whyte. (2023). Appendix B Construction Soil and Water Monitoring Program M12 Motorway – Central August 2023, Rev E. *Construction Environmental Management Plan Appendix B4 Construction Soil and Water Management Sub-plan M12 Motorway – Central July 2023, Rev E.*

TfNSW. (2021). *Overarching Construction Environmental Management Plan, Appendix B4.* Sydney: NSW Government. Retrieved from <https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSI-9364-PA-46%2120211220T053303.892%20GMT>

Appendices

Appendix A

Figure



Appendix B

Tables



Appendix B
Table B1
Monitoring Well Status - April 2019 to March 2024

Transport for NSW
M12 Motorway
Groundwater Monitoring Program

		Event 1 April 2019	Event 2 May 2019	Event 3 June 2019	Event 4 July 2019	Event 5 August 2019	Event 6 September 2019	Event 7 October 2019	Event 8 November 2019	Event 9 December 2019	Event 10 January 2020	Event 11 February 2020	Event 12 March 2020	Event 13 April 2020	Event 14 May 2020	Event 15 June 2020
Well ID																
Package	West	BH102														
		BH104			No access											No access
		BH104R														
		BH105														
		BH107	No access	No access	No access	Bailer					No access	Parameters ¹	No access			No access
		BH107R														
		BH112	No access	No access	No access	Bailer					No access	Parameters ¹	No access		Bailer	No access
		BH112R														
		BH117														
		BH119														
		BH202														
		BH204														
		BH207														
		BH209														
	Central	BH129														
		BH134														
		BH135														
		BH139														
		BH144														
		BH145	No access	No access		Bailer	Bailer	Bailer	Bailer	No access	Bailer	No access	No access	No access		No access
		BH145R														
		BH150														
		BH211														
		BH215														
		BH217														
		BH219														
		BH221														
		BH223														
		BH227														
	East	BH155														
		BH162														
		BH170														
		BH175														

Well sampled
 Not sampled
 Not required
Not located - Attempts to locate well for sampling or sample was made
No access - due to property restrictions and/or wet weather
¹ Insufficient water to collect groundwater sample
² No field parameters collected due to insufficient water



Appendix B
Table B1
Monitoring Well Status - April 2019 to March 2024

Transport for NSW
M12 Motorway
Groundwater Monitoring Program

		Event 16 July 2020	Event 17 August 2020	Event 18 September 2020	Event 19 October 2020	Event 20 November 2020	Event 21 December 2020	Event 22 January 2021	Event 23 February 2021	Event 24 March 2021	Event 25 April 2021	Event 26 May 2021	Event 27 June 2021	Event 28 July 2021	Event 29 August 2021	Event 30 September 2021
Well ID																
Package	West	BH102														
		BH104														
		BH104R														
		BH105														
		BH107				No access										
		BH107R														
		BH112				No access										
		BH112R														
		BH117														
		BH119														
		BH202														
		BH204														
		BH207														
		BH209														
	Central	BH129														
		BH134														
		BH135														
		BH139														
		BH144														
		BH145		Bailer				Bailer ²	Bailer ²			1,2	Bailer ²	Bailer ²	No access	Bailer ²
		BH145R														
		BH150														
		BH211														
		BH215														
		BH217														
		BH219														
		BH221														
		BH223														
		BH227														
	East	BH155														
		BH162														
		BH170														
		BH175														

Well sampled
 Not sampled
 Not required
Not located - Attempts to locate well for sampling or sample was made
No access - due to property restrictions and/or wet weather
¹ Insufficient water to collect groundwater sample
² No field parameters collected due to insufficient water



Appendix B
Table B1
Monitoring Well Status - April 2019 to March 2024

Transport for NSW
M12 Motorway
Groundwater Monitoring Program

		Event 31 October 2021	Event 32 November 2021	Event 33 December 2021	Event 34 January 2022	Event 35 February 2022	Event 36 March 2022	Event 37 April 2022	Event 38 May 2022	Event 39 June 2022	Event 40 July 2022	Event 41 August 2022	Event 42 September 2022	Event 43 October 2022	Event 44 November 2022	Event 45 December 2022
Well ID																
Package	West	BH102														
		BH104							Bailer							Destroyed
		BH104R														
		BH105														Destroyed
		BH107							Bailer	Bailer	Bailer	Bailer	Bailer			Destroyed
		BH107R														
		BH112							Bailer	Bailer	Bailer	Bailer	Bailer			Destroyed
		BH112R														No access
		BH117										No access		No access		Destroyed
		BH119										No access		No access		Destroyed
		BH202														Destroyed
		BH204										No access		No access		Destroyed
		BH207										No access		Not located		Destroyed
		BH209														Destroyed
	Central	BH129														Destroyed
		BH134														
		BH135										Not located				Destroyed
		BH139										Not located		Not located		Destroyed
		BH144														Destroyed
		BH145	Bailer ²	Bailer ²	Bailer ²	Bailer ²	Bailer ²		Bailer	Bailer ²	Bailer	Bailer ²	Bailer ²	Bailer	Bailer	Bailer ²
		BH145R														
		BH150										No access				Destroyed
		BH211														Destroyed
		BH215										Not located		Not located		Destroyed
		BH217										No access				Destroyed
		BH219										No access		Not located		
		BH221										No access		Destroyed		
		BH223										No access		Destroyed		
		BH227										No access		Destroyed		
	East	BH155														
		BH162										No access				
		BH170										No access		Not located		Not located
		BH175										No access				

Well sampled
 Not sampled
 Not required

Not located - Attempts to locate well for sampling or sample was made
No access - due to property restrictions and/or wet weather
¹ Insufficient water to collect groundwater sample
² No field parameters collected due to insufficient water



Appendix B
Table B1
Monitoring Well Status - April 2019 to March 2024

Transport for NSW
M12 Motorway
Groundwater Monitoring Program

		Event 46 January 2023	Event 47 February 2023	Event 48 March 2023	Event 49 April 2023	Event 50 May 2023	Event 51 June 2023	Event 52 July 2023	Event 53 August 2023	Event 54 September 2023	Event 55 October 2023	Event 56 November 2023	Event 57 December 2023	Event 58 January 2024	Event 59 February 2024	Event 60 March 2024
Well ID																
Package	West	BH102			Destroyed											
		BH104														
		BH104R														
		BH105														
		BH107														
		BH107R	No access				No access									
		BH112														
		BH112R	No access	No access	No access	No access			Bailer							
		BH117														
		BH119														
		BH202														
		BH204														
		BH207														
		BH209														
	Central	BH129														
		BH134			Destroyed											
		BH135														
		BH139														
		BH144														
		BH145	Bailer ²	Bailer ²	Bailer ²	Not required										
		BH145R							Bailer							
		BH150														
		BH211														
		BH215														
		BH217														
		BH219														
		BH221														
		BH223														
		BH227														
	East	BH155											Destroyed			
		BH162											Destroyed			
		BH170		Not located		Not located		Not located			Not located		Not located		Not located	
		BH175														

Well sampled
 Not sampled
 Not required
Not located - Attempts to locate well for sampling or sample was made
No access - due to property restrictions and/or wet weather
¹ Insufficient water to collect groundwater sample
² No field parameters collected due to insufficient water



Appendix B
Table B2
Groundwater Analytical Results for Baseline Monitoring Period (April 2019 to July 2022)

Inorganics		Acidity & Alkalinity		Major Ions										Minor Ions		Nutrients									
Electrical conductivity (Iab)	µS/cm	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Total Dissolved Solids	mg/L	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Total Suspended Solids	mg/L	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Alkalinity (Carbonate as CaCO3)	mg/L	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Alkalinity (Hydroxide as CaCO3)	mg/L	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Alkalinity (total as CaCO3)	mg/L	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Hardness as CaCO3 (Filtered)	mg/L	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Calcium	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Calcium (Filtered)	mg/L	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Magnesium	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Magnesium (Filtered)	mg/L	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Potassium	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Potassium (Filtered)	mg/L	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sodium	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sodium (Filtered)	mg/L	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Chloride	mg/L	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Sulfate	mg/L	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sulfate (Filtered)	mg/L	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}	500 ^{#1}
Cations Total	meq/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Anions Total	meq/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Ionic Balance	%	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Bicarbonate Ion (HCO3-)	mg/L	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Carbonate ion	mg/L	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Ammonia as N	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Nitrate (as N)	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Nitrite (as N)	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Nitrogen (Total Oxidised) (as N)	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Nitrogen (Total)	mg/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Kjeldahl Nitrogen Total	mg/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Reactive Phosphorus as P	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Phosphate total (P)	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Phosphorus (Total)	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Number of Results	1	91	89	87	56	56	0	91	342	6500	6500	15400	22200	ND	1700	ND	981	0.55	989	1082	118	228	224	20	137	1697	2393	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877	1877

Appendix B
Table B2
Groundwater Analytical Results for Baseline Monitoring Period (April 2019 to July 2022)

ECOL		ADWGC 2011 Health (v3.7 updated 2022)	ANZEGC 2000 - Lowland Rivers (NSW coastal rivers)	ANZEGC 2000 - Stock Watering	ANZG (2018) - FW - 95% (updated 26 July 2021)	NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand	2-m	4-8m	>8m
Metals	Arsenic (Filtered)	0.01	0.01	0.5	0.013 ^{#11}	0.0002	0.001 ^{#12}	0.0014	
	Cadmium (Filtered)	0.0001	0.0001	1	0.0002				
	Chromium (III+VI) (Filtered)	0.001	0.001	1 ^{#8}					
	Copper (Filtered)	0.001	0.001	2					
	Iron (Filtered)	0.05	0.001		0.0034	1.9	0.0006	0.011	0.008
	Lead (Filtered)	0.001	0.001	0.1					
	Manganese (Filtered)	0.001	0.001	0.01					
	Nickel (Filtered)	0.0001	0.0001	0.002					
	Mercury (Filtered)	0.0001	0.0001	0.001					
	Zinc (Filtered)	0.005	0.001	1					
	Benzene	2	2	800	180	80	350		
	Ethylbenzene	2	2	300					
	Xylene (o)	2	2						
	Xylene (m & p)	2	2						
	Xylene Total	2	2	600					
	BTEX (Sum of Total) - Lab Calc	1	1						
	Naphthalene (BTEXN suite)	5			16				
	F1 (C6-C10 minus BTEX)	20	20						
	C6-C10 Fraction	20	20						
BTEXN	F2 (>C10-C16 minus Naphthalene)	100	100						
	>C10-C16 Fraction	100	100						
	F3 (>C16-C34 Fraction)	100	100						
	F4 (>C34-C40 Fraction)	100	100						
	>C10-C40 (Sum of Total)	100	100						
TRH - NEPM 2013	C6-C9 Fraction	20	20						
	C10-C14 Fraction	50	50						
	C15-C28 Fraction	100	100						
	C29-C36 Fraction	50	50						
	C10-C36 (Sum of Total)	50	50						
TRH - NEPM 1999	PAHs - standard 16	1	1	0.01	0.2				
	Benzo(a)pyrene	0.5	1						
	Benzo(e)anthracene	1	1						
	Acenaphthylene	1	1						
	Acenaphthene	1	1						
PAHs - standard 16	Benzo(b)fluoranthene	1	1						

			M12 - Central																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					

Appendix B
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Groundwater Analytical Results for Baseline Monitoring Period (April 2019 to July 2022)

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Appendix B
Table B2
Groundwater Analytical Results for Baseline Monitoring Period (April 2019 to July 2022)

ECOL	ADWGC 2011 Health (v3.7 updated 2022)		ANZEGC 2000 - Lowland Rivers (NSW coastal rivers)		ANZEGC 2000 - Stock Watering		ANZG (2018) - FW - 95% (updated 26 July 2021)		NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand		2-4m		4-8m		>8m	
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
PAHs - standard 16	Benzox(k)fluoranthene	1														
	Benzo(g,h,i)perylene	1														
	Cnysene	1														
	Dibenz(a,h)anthracene	1														
	Fluoranthene	1														
	Fluorene	1														
	Indeno(1,2,3-c,d)pyrene	1														
	Naphthalene-PAH	1														
	Phenanthrene	1														
	Pyrene	1														
Phenols - Halogenated	Sum of standard 16 PAHs	0.5	0.01													
	PAHs (Sum of total) - Lab calc	0.5	0.01													
	Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	0.5														
	2-Chlorophenol	1	300													
	2,4-Dichlorophenol	1	200													
	2,4,5-Trichlorophenol	1														
	2,4,6-Trichlorophenol	1	20													
	2,6-Dichlorophenol	1														
	4-Chloro-3-methylphenol	1														
	Pentachlorophenol	2	10													
Phenols - Non-Halogenated	tetrachlorophenols	30														
	Phenols (halogenated)	10														
	Phenol	1														
	2-Nitrophenol	1														
	2-Methylphenol (o-Cresol)	1														
	3,4-Methylphenol (m,p-cresol)	2														
	2,4-Dimethylphenol	1														
	2,4-Dinitrophenol	30														
	4,6-Dinitro-2-methylphenol	30														
	4,6-Dinitro-o-cyclohexyl phenol	100														
OC Pesticides	4-Nitrophenol	30														
	Phenols (Total Non Halogenated)	100														
	Organochlorine pesticides EPA/vic	0.01														
	Other organochlorine pesticides EPA/vic	0.01														
	4,4'-DDE	0.01														
	a-BHC	0.01														
	Aldrin	0.01														
	Aldrin + Dieldrin	0.01														
	b-BHC	0.01														
	Chlordane	0.01														

M12 - West		M12 - Central		M12 - West	
BH112	BH145	BH145	BH145	BH145	BH145
08-Nov-21	BH112	BH145	Normal	ES2140334	Normal
08-Dec-21	BH112	BH112	Interlab D	856978	Normal
13-Jan-22	BH112	BH112	Normal	ES2201179	Normal
10-Feb-22	BH112	Field D	ES2204606	ES2204606	Normal
18-Mar-22	BH112	Interlab D	874238	ES2209694	Normal
25-May-22	BH112	Normal	ES2218210	ES2218210	Normal
27-Jun-22	BH112	Normal	ES2222571	ES2222571	Normal
20-Jul-22	BH112	Normal	ES2225656	ES2225656	Normal
20-Jul-22	BH112	Field D	ES2225656	Field D	ES2225656
20-Jul-22	BH112	Normal	ES2225656	Normal	ES2225656
13-Aug-20	BH145	Normal	ES2028325	740880	Normal
26-Aug-20	BH145	Normal	ES2032115	ES2032115	Normal
09-Sep-20	BH145	Normal	ES2035519	ES2040330	Normal
11-Nov-20	BH145	Normal	ES2040330	Field D	ES2040667
12-Nov-20	BD01	Field D	ES2040667	ES2043799	Normal
09-Dec-20	BH145	Normal	ES2101242	ES2104999	Normal
12-Jan-21	BH145	Normal	ES2108508	ES2112804	Normal
07-Apr-21	BH145	Normal	ES2125048	ES2131753	Normal
08-Jun-21	BH145	Normal	ES2121745	ES2125048	Normal
07-Jul-21	BH145	Normal	ES2131753	ES2137338	Normal
01-Sep-21	BH145	Normal	ES2137338	Interlab D	839397
08-Nov-21	BH145	Normal	ES2140334	ES2140334	Normal
08-Dec-21	BH145	Normal	ES2144782	ES2201179	Normal
13-Jan-22	BH145	Normal	ES2201179	ES2204606	Normal
10-Feb-22	BH145	Normal	ES2209694	ES2218210	Normal
25-May-22	BH145	Interlab D	892629	ES2218210	Normal
25-May-22	BH145	Normal	ES2218210	ES2218210	Normal
27-Jun-22	BH145	Normal	ES2222571	ES2222571	Normal
20-Jul-22	BH145	Normal	ES2225656	ES2225656	Normal

PAHs - standard 16		ECOL	ADWGC 2011 Health (v3.7 updated 2022)	ANZECC 2000 - Lowland Rivers (NSW coastal rivers)	ANZECC 2000 - Stock Watering	ANZG (2018) - FW - 95% (updated 26 July 2021)	NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand	2-4m	4-8m	>8m
PAHs - standard 16	Benzo(k)fluoranthene	µg/L	1							
	Benzo(g,h,i)perylene	µg/L	1							
	Chrysene	µg/L	1							
	Dibenz(a,h)anthracene	µg/L	1							
	Fluoranthene	µg/L	1				1.4			
	Fluorene	µg/L	1							
	Indeno(1,2,3-c,d)pyrene	µg/L	1							
	Naphthalene-PAH	µg/L	1							
	Phenanthrene	µg/L	1				2			
	Pyrene	µg/L	1							
Phenols - Halogenated	Sum of standard 16 PAHs	µg/L	0.5	0.01	0.01					
	PAHs (Sum of total) - Lab calc	µg/L	0.5	0.01						
	Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	µg/L	0.5							
	2-Chlorophenol	µg/L	1	300	490	160				
	2,4-Dichlorophenol	µg/L	1	200						
	2,4,5-Trichlorophenol	µg/L	1			20				
	2,4,6-Trichlorophenol	µg/L	1							
	4-Chloro-3-methylphenol	µg/L	1	10						
	Pentachlorophenol	µg/L	2							
	tetrachlorophenols	µg/L	30							
Phenols - Non-Halogenated	Phenols (halogenated)	µg/L	10			320				
	Phenol	µg/L	1							
	2-Nitrophenol	µg/L	1							
	2-Methylphenol (o-Cresol)	µg/L	1							
	2,4-Dimethylphenol	µg/L	1							
	2,4-Dinitrophenol	µg/L	30							
	4,6-Dinitro-2-methylphenol	µg/L	30							
	4,6-Dinitro-o-cyclohexyl phenol	µg/L	100							
	4-Nitrophenol	µg/L	30							
	Phenols (Total Non Halogenated)	µg/L	100							
OC Pesticides	Organochlorine pesticides EPA/Vic	µg/L	0.01							
	Other organochlorine pesticides EPA/Vic	µg/L	0.01							
	4,4'-DDE	µg/L	0.01							
	a-BHC	µg/L	0.01							
	Aldrin	µg/L	0.01							
	Aldrin + Dieldrin	µg/L	0.01							
OC Pesticides	b-BHC	µg/L	0.01							
	Chlordane	µg/L	0.01			0.08				

Statistical Summary													
Number of Results	50	50	50	50	50	50	50	50	50	50	50	50	50
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Median Concentration	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Geometric Average	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0	0
Geometric Standard Deviation	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Number of Guideline Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	0	0	0	0	0
% of Results at or above the Detect Limit	0	0	0	0	0	0	0	0	0	0	0	0	0
% of Results below the Detect Limit	100	100	100	100	100	100	100	100	100	100	100	100	100
% of Detects at or above Guidelines	0	0	0	0	0	0	0	0	0	0	0	0	0
% of Results Below Guidelines or Non-Detect	100	100	100	100	100	100	100	100	100	100	100	100	100
A Non-Detect multiplier of 0.5 has been applied.													

Env Sids Comments
#1:Not specifically guideline value: >500mg/L can have purgative effects
#2:Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
#3:Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).

#4:Calculated from ammonia NH4
#5:Loss of production expected at 5000 mg/L for beef cattle, 4000 mg/L dairy cattle, 10000 mg/L sheep, 6000 mg/L horses and pigs, 3000 mg/L poultry
#6:400 mg/L divided by molecular weight, stock may tolerate higher nitrate concentrations if nitrate in feed are not high, water containing >1500 mg/L (as NO3) is likely to be toxic.
#7:30 mg/L divided by molecular weight
#8:>0.5 mg/L hazardous to sheep, >1 mg/L for cattle, >5 mg/L pigs and poultry
#9:Measured as NH3-N at pH 8
#10:Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
#11:In absence of total As guideline, As (V) guideline has been adopted.
#12:In absence of total Cr guideline, Cr (VI) guideline has been adopted.
#13:Not limiting: Derived water HSL exceeds water solubility limit
#14:To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.

Data Comments
#1 Reported Analyte LOR is higher than Requested Analyte LOR

Appendix B
Table B2
Groundwater Analytical Results for Baseline Monitoring Period (April 2019 to July 2022)

OC Pesticides		OP Pesticides	
Chlordane (cis)	µg/L	Chlorpyrifos	µg/L
Chlordane (trans)	0.01 µg/L	Chlorpyrifos-methyl	0.02 µg/L
d-BHC	0.01 µg/L	Coumaphos	0.01 µg/L
4,4 DDD	0.01 µg/L	Demeton-O	0.02 µg/L
4,4 DDT	0.01 µg/L	Demeton-S	0.02 µg/L
DDT+DDE+DDD - Lab Calc	0.01 µg/L		
Dieldrin	0.01 µg/L		
Endosulfan	0.01 µg/L		
Endosulfan I (alpha)	0.01 µg/L		
Endosulfan II (beta)	0.01 µg/L		
Endosulfan Sulfate	0.01 µg/L		
Endrin	0.01 µg/L		
Endrin aldehyde	0.01 µg/L		
Endrin ketone	0.01 µg/L		
g-BHC (Lindane)	0.01 µg/L		
Heptachlor	0.005 µg/L		
Heptachlor epoxide	0.01 µg/L		
Hexachlorobenzene	0.01 µg/L		
Methoxychlor	0.01 µg/L		
Oxychlordane	0.01 µg/L		
Toxaphene	0.01 µg/L		
Bensulide	0.1 µg/L		
Naftalofos	1 µg/L		
Tokuthion	1 µg/L		
Azinphos methyl	0.02 µg/L		
Boistar (Sulprofos)	0.05 µg/L		
Bromophos-ethyl	0.1 µg/L		
Carbophenothion	0.02 µg/L		
Azinphos Ethyl	0.02 µg/L		
Chlorfenvinphos	0.02 µg/L		
Chlorpyrifos	0.02 µg/L		
Chlorpyrifos-methyl	0.2 µg/L		
Coumaphos	0.01 µg/L		
Demeton-O	0.02 µg/L		
Demeton-S	0.02 µg/L		
ADWG 2011 Health (v3.7 updated 2022)		ADWG 2011 Health (v3.7 updated 2022)	
ANZECC 2000 - Lowland Rivers (NSW coastal rivers)		ANZECC 2000 - Stock Watering	
ANZG (2018) - FW - 95% (updated 26 July 2021)		ANZG (2018) - FW - 95% (updated 26 July 2021)	
NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand		NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand	
		2-4m	
		4-8m	
		>8m	

Package	Location	Code	Sample Date	Field ID	Type	Lab Report
M12 - West	BH104	BH104	16-Jul-19	BH104	Normal	ES1922192
		BH104	20-Aug-19	BH104	Normal	ES1926460
		BH104	24-Sep-19	BH104	Normal	ES1930997
		BH104	22-Oct-19	BH104	Normal	ES1934707
		BH104	07-Nov-19	BH104	Normal	ES1936840
		BH104	12-Dec-19	BH104	Normal	ES1941279
		BH104	16-Jan-20	BH104	Normal	ES2001376
		BH104	18-Feb-20	BH104	Normal	ES2005577
		SD01	12-Mar-20	Interlab D	707829	
		BD01	12-Mar-20	Field D	ES2008731	
		BH104	23-Apr-20	BH104	Normal	ES2013858
		BH104	19-May-20	BH104	Normal	ES2017191
		BH104	30-Jul-20	BH104	Normal	ES2026408
		BH104	11-Aug-20	BH104	Normal	ES2027951
		BD01	10-Sep-20	Field D	ES2032115	
		BH104	09-Oct-20	Field D	ES2035519	
		BH104	13-Nov-20	BH104	Normal	ES2035519
		BH104	08-Dec-20	BH104	Normal	ES2043799
		M12GW DUF	14-Jan-21	Field D	ES2043799	
		BH104	11-Feb-21	Field D	ES2104999	
		BH104	10-Mar-21	Field D	ES2108508	
		M12GWDUP	07-Apr-21	Field D	ES2112804	
		BH104	04-May-21	Normal	ES2116634	
		M12GWDUP	08-Jun-21	Field D	ES2121745	
		M12GWDUP	07-Jul-21	Normal	ES2125048	
		BH104	13-Aug-21	Field D	ES2129596	
		M12GWDUP	01-Sep-21	Field D	ES2131753	
		M12GWDUP	15-Oct-21	Field D	ES2137338	
		BH104	08-Nov-21	Field D	ES2140334	
		BH104	08-Dec-21	Field D	ES2144782	
		BH104	13-Jan-22	Field D	ES2201179	
		BH104	10-Feb-22	Interlab D	863166	
		BH104	18-Mar-22	Normal	ES2204606	
		BH104	25-May-22	Normal	ES2218210	
		BH104	27-Jun-22	Interlab D	901087	
		BH104	27-Jun-22	Normal	ES2222571	
		BH104	20-Jul-22	Interlab D	907459	
		BH104	20-Jul-22	Normal	ES2225656	

Appendix B
Table B2
Groundwater Analytical Results for Baseline Monitoring Period (April 2019 to July 2022)

OC Pesticides		OP Pesticides	
Chlordane (cis)	µg/L	Chlorpyrifos	µg/L
Chlordane (trans)	0.01 µg/L	Chlorpyrifos-methyl	0.02 µg/L
d-BHC	0.01 µg/L	Cumaphos	0.01 µg/L
4,4 DDD	0.01 µg/L	Demeton-O	0.02 µg/L
4,4 DDT	0.01 µg/L	Demeton-S	0.02 µg/L
DDT+DDE+DDD - Lab Calc	0.01 µg/L		
Dieldrin	0.01 µg/L		
Endosulfan	0.01 µg/L		
Endosulfan I (alpha)	0.01 µg/L		
Endosulfan II (beta)	0.01 µg/L		
Endosulfan Sulfate	0.01 µg/L		
Endrin	0.01 µg/L		
Endrin aldehyde	0.01 µg/L		
Endrin ketone	0.01 µg/L		
g-BHC (Lindane)	0.01 µg/L		
Heptachlor	0.005 µg/L		
Heptachlor epoxide	0.01 µg/L		
Hexachlorobenzene	0.01 µg/L		
Methoxychlor	0.01 µg/L		
Oxychlordane	0.01 µg/L		
Toxaphene	0.01 µg/L		
Bensulide	0.1 µg/L		
Naftalofos	1 µg/L		
Tokuthion	1 µg/L		
Azinphos methyl	0.02 µg/L		
Baistar (Sulprofos)	0.05 µg/L		
Bromophos-ethyl	0.1 µg/L		
Carbophenothion	0.02 µg/L		
Azinphos Ethyl	0.02 µg/L		
Chlorfenvinphos	0.02 µg/L		
Chlorpyrifos	0.02 µg/L		
Chlorpyrifos-methyl	0.2 µg/L		
Cumaphos	0.01 µg/L		
Demeton-O	0.02 µg/L		
Demeton-S	0.02 µg/L		
ADWG 2011 Health (v3.7 updated 2022)		ADWG 2011 Health (v3.7 updated 2022)	
ANZECC 2000 - Lowland Rivers (NSW coastal rivers)		ANZECC 2000 - Stock Watering	
ANZG (2018) - FW - 95% (updated 26 July 2021)		NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand	
		2-4m	
		4-8m	
		>8m	

M12 - West	BH107	BH107	18-Jul-19	BH107	Normal	ES1922601	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

OP Pesticides		OC Pesticides	
Chloridane (cis)	0.01 µg/L	0.01	ADWG 2011 Health (V3.7 updated 2022)
Chlordane (trans)	0.01 µg/L	0.01	ANZECC 2000 - Lowland Rivers (NSW coastal rivers)
d-BHC	0.01 µg/L	0.01	ANZECC 2000 - Stock Watering
4,4 DDD	0.01 µg/L	0.01	ANZG (2018) - FW - 95% (updated 26 July 2021)
4,4 DDT	0.01 µg/L	0.01	NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand
DDT +DDE+DDD - Lab Calc	0.01 µg/L	0.01	
Dieldrin	0.01 µg/L	0.01	
Endosulfan	0.01 µg/L	0.01	0.2
Endosulfan I (alpha)	0.01 µg/L	0.01	
Endosulfan II (beta)	0.01 µg/L	0.01	
Endosulfan Sulfate	0.01 µg/L	0.01	0.02
Endrin	0.01 µg/L	0.01	
Endrin aldehyde	0.01 µg/L	0.01	
Endrin ketone	0.01 µg/L	0.01	
g-BHC (Lindane)	0.01 µg/L	0.01	0.2
Heptachlor	0.005 µg/L	0.005	0.09
Heptachlor epoxide	0.01 µg/L	0.01	
Hexachlorobenzene	0.01 µg/L	0.01	0.1
Methoxychlor	0.01 µg/L	0.01	
Oxychloridane	0.01 µg/L	0.01	
Toxaphene	0.01 µg/L	0.01	0.2
Bensulide	0.1 µg/L	0.1	
Natfalofo	1 µg/L	1	
Tokuthion	1 µg/L	1	
Azinphos methyl	0.02 µg/L	0.02	0.02
Bolstar (Sulprofos)	0.05 µg/L	0.05	
Bromophos-ethyl	0.1 µg/L	0.1	
Carbophenothion	0.02 µg/L	0.02	
Azinphos Ethyl	0.02 µg/L	0.02	
Chlorfenvinphos	0.02 µg/L	0.02	
Chlorpyrifos	0.02 µg/L	0.02	0.01
Chlorpyrifos-methyl	0.2 µg/L	0.2	
Coumaphos	0.01 µg/L	0.01	
Demeton-O	0.02 µg/L	0.02	
Demeton-S	0.02 µg/L	0.02	

[illegible]

Appendix B
Table B2
Groundwater Analytical Results for Baseline Monitoring Period (April 2019 to July 2022)

OC Pesticides										OP Pesticides									
Chlordane (cis)	µg/L	0.01								µg/L	0.01								
Chlordane (trans)	µg/L	0.01								µg/L	0.01								
d-BHC	µg/L	0.01								µg/L	0.01								
4,4 DDD	µg/L	0.01								µg/L	0.02								
4,4 DDT	µg/L	0.01								µg/L	0.02								
DDT+DDE+DDD - Lab Calc	µg/L	0.01								µg/L	0.02								
Dieldrin	µg/L	0.01								µg/L	0.02								
Endosulfan	µg/L	0.01								µg/L	0.02								
Endosulfan I (alpha)	µg/L	0.01								µg/L	0.02								
Endosulfan II (beta)	µg/L	0.01								µg/L	0.02								
Endrin	µg/L	0.01								µg/L	0.01								
Endrin aldehyde	µg/L	0.01								µg/L	0.01								
Endrin ketone	µg/L	0.01								µg/L	0.01								
g-BHC (Lindane)	µg/L	0.01								µg/L	0.01								
Heptachlor	µg/L	0.005								µg/L	0.01								
Heptachlor epoxide	µg/L	0.01								µg/L	0.01								
Hexachlorobenzene	µg/L	0.01								µg/L	0.01								
Methoxychlor	µg/L	0.01								µg/L	0.01								
Oxychlordane	µg/L	0.01								µg/L	0.01								
Toxaphene	µg/L	0.01								µg/L	0.01								
Bensulide	µg/L	0.1								µg/L	0.1								
Natfialofos	µg/L	1								µg/L	1								
Tokuthion	µg/L	1								µg/L	1								
Azinphos methyl	µg/L	0.02								µg/L	0.02								
Bolstar (Sulprofos)	µg/L	0.05								µg/L	0.05								
Bromophos-ethyl	µg/L	0.1								µg/L	0.1								
Carbophenothion	µg/L	0.02								µg/L	0.02								
Azinphos Ethyl	µg/L	0.02								µg/L	0.02								
Chlorfenvinphos	µg/L	0.02								µg/L	0.02								
Chlorpyrifos	µg/L	0.02								µg/L	0.02								
Chlorpyrifos-methyl	µg/L	0.2								µg/L	0.2								
Coumaphos	µg/L	0.01								µg/L	0.01								
Demeton-O	µg/L	0.02								µg/L	0.02								
Demeton-S	µg/L	0.02								µg/L	0.02								
ANZECC 2000 - Lowland Rivers (NSW coastal rivers)										ANZECC 2000 - Stock Watering									
ANZECC 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand										ANZG (2018) - FW - 95% (updated 26 July 2021)									
NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand										ANZG (2018) - FW - 95% (updated 26 July 2021)									
2-4m										0.01									
4-8m										0.02									
>8m										0.05									

Number of Results	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
Minimum Concentration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Average Concentration	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Median Concentration	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geometric Standard Deviation																			
Number of Guideline Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% of Results at or above the Detect Limit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% of Results below the Detect Limit	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
% of Detects at or above Guidelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% of Results Below Guidelines or Non-Detect																			

Env Sids Comments

#1:Not specifically guideline value: >500mg/L can have purgative effects
#2:Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
#3:Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).

#4:Calculated from ammonia NH4
#5:Loss of production expected at 5000 mg/L for beef cattle, 4000 mg/L dairy cattle, 10000 mg/L sheep, 6000 mg/L horses and pigs, 3000 mg/L poultry
#6:400 mg/L divided by molecular weight, stock may tolerate higher nitrate concentrations if nitrate in feed are not high, water containing >1500 mg/L (as NO3) is likely to be toxic.
#7:30 mg/L divided by molecular weight
#8:>0.5 mg/L hazardous to sheep, >1 mg/L for cattle, >5 mg/L pigs and poultry
#9:Measured as NH3-N at pH 8
#10:Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
#11:In absence of total As guideline, As (V) guideline has been adopted.
#12:In absence of total Cr guideline, Cr (VI) guideline has been adopted.
#13:Not limiting: Derived water HSL exceeds water solubility limit
#14:To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.

Data Comments

#1 Reported Analyte LOR is higher than Requested Analyte LOR

Appendix B
Table B2
Groundwater Analytical Results for Baseline Monitoring Period (April 2019 to July 2022)

OP Pesticides									
Pesticide	Concentration (µg/L)	ANZGECG 2000 - Lowland Rivers (NSW coastal rivers)							
		ANZGECG 2000 - Stock Watering	ANZG (2018) - FW - 95% (updated 26 July 2021)	NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand					
				2-4m	4-8m	>8m			
Demeton-S-methyl	0.02		0.01						
Diazinon	0.01		0.01						
Dichlorvos	0.2		0.2						
Dimethoate	0.02		0.02						
Disulfoton	0.05		0.05						
EPN	0.05		0.05						
Ethion	0.02		0.02						
Ethoprop	0.01		0.01						
Fenamiphos	0.01		0.01						
Fenitrothion	0.01		0.01						
Fensulfotlhon	0.01		0.01						
Fenathion	0.05		0.05						
Malathion	0.02		0.02						
Merphos	1		1						
Methidathion	0.1		0.1						
Methyl parathion	0.5		0.5						
Mevinphos (Phosdrin)	0.02		0.02						
Monocrotophos	0.02		0.02						
Naled (Dibrom)	1		1						
Omethoate	0.01		0.01						
Parathion	0.2		0.2						
Phorate	0.1		0.1						
Priniphos-ethyl	0.01		0.01						
Priniphos-methyl	0.01		0.01						
Prothiofos	0.01		0.01						
Pyrazophos	0.1		0.1						
Ronnel	10		10						
Sulfotepp	0.005		0.005						
Terbufos	0.01		0.01						
Thiometon	0.5		0.5						
Trichloronate	0.1		0.1						
Tetrachlorvinphos	0.01		0.01						

M12 - West	BH107	18-Jul-19	BH107	Normal	ES1922601	<0.02	<0.01	<0.2	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	&lt

Appendix B
Table B2
Groundwater Analytical Results for Baseline Monitoring Period (April 2019 to July 2022)

EQI	ADWG 2011 Health (v3.7 updated 2022)										
	µg/L	0.5	0.02	µg/L	20	0.02	0.02	µg/L	0.005	10	100
	Acephate			Demeton-O & Demeton-S	Formothion	Temephos	Trichlorfon	Tiazophos	Foseyl-al	Dinoseb	
Pesticides											
	Herbicides										
	Fungicides										

M12 - West	BH104	16-Jul-19	BH104	Normal	ES1922192	<0.5	<0.02	<0.02	<0.005	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10</



Appendix B
Table B2
Groundwater Analytical Results for Baseline Monitoring Period (April 2019 to July 2022)

Pesticides		Fungicides		Herbicides	
Acephate	µg/L	µg/L	µg/L	µg/L	µg/L
	0.5	0.02	20	0.02	10
	50	400	7		100
Demeion-O & Demeion-S	µg/L	µg/L	µg/L	µg/L	µg/L
	0.02	20	0.02	0.02	10
	50	400	7		100
Formothion	µg/L	µg/L	µg/L	µg/L	µg/L
	0.02	20	0.02	0.02	10
	50	400	7		100
Temephos	µg/L	µg/L	µg/L	µg/L	µg/L
	0.02	20	0.02	0.02	10
	50	400	7		100
Trichlorfon	µg/L	µg/L	µg/L	µg/L	µg/L
	0.02	20	0.02	0.02	10
	50	400	7		100
Tiazophos	µg/L	µg/L	µg/L	µg/L	µg/L
	0.02	20	0.02	0.02	10
	50	400	7		100
ADWGC 2011 Health (v3.7 updated 2022)	µg/L	µg/L	µg/L	µg/L	µg/L
	0.5	0.02	20	0.02	10
	50	400	7		100
ANZECC 2000 - Lowland Rivers (NSW coastal rivers)	µg/L	µg/L	µg/L	µg/L	µg/L
	0.02	20	0.02	0.02	10
	50	400	7		100
ANZECC 2000 - Stock Watering	µg/L	µg/L	µg/L	µg/L	µg/L
	0.02	20	0.02	0.02	10
	50	400	7		100
ANZG (2018) - FW - 95% (updated 26 July 2021)	µg/L	µg/L	µg/L	µg/L	µg/L
	0.02	20	0.02	0.02	10
	50	400	7		100
NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand	µg/L	µg/L	µg/L	µg/L	µg/L
	0.02	20	0.02	0.02	10
	50	400	7		100
2-4m	µg/L	µg/L	µg/L	µg/L	µg/L
	0.02	20	0.02	0.02	10
	50	400	7		100
4-8m	µg/L	µg/L	µg/L	µg/L	µg/L
	0.02	20	0.02	0.02	10
	50	400	7		100
>8m	µg/L	µg/L	µg/L	µg/L	µg/L
	0.02	20	0.02	0.02	10
	50	400	7		100

M12 - West	BH107	18-Jul-19	BH107	Normal	ES19222601	<0.5	<0.02	<0.02	<0.005	<10
		24-Sep-19	BH107	Normal	ES1926460	<0.5	<0.02	<0.02	<0.005	<10
		22-Oct-19	BH107	Normal	ES1934707	<0.5	<0.02	<0.02	<0.005	<10
		07-Nov-19	BH107	Normal	ES1936840	<0.5	<0.02	<0.02	<0.005	<10
		12-Dec-19	BH107	Normal	ES1941279	<0.5	<0.02	<0.02	<0.005	<10
		20-Feb-20	BH107	Normal	ES2005947	<0.5	<0.02	<0.02	<0.005	<10
		23-Apr-20	BH107	Normal	ES2013858	<0.5	<0.02	<0.02	<0.005	<10
		21-May-20	BH107	Normal	ES2017665	<0.5	<0.02	<0.02	<0.005	<10
		30-Jul-20	BH107	Normal	ES2026408	<0.5	<0.02	<0.02	<0.005	<10
		11-Aug-20	BH107	Normal	ES2027951	<0.5	<0.02	<0.02	<0.005	<10
		10-Sep-20	BH107	Normal	ES2032115	<0.5	<0.02	<0.02	<0.005	<10
		09-Oct-20	BH107	Normal	ES2035519	<0.5	<0.02	<0.02	<0.005	<10
		08-Dec-20	BH107	Normal	ES2043799	<0.5	<0.02	<0.02	<0.005	<10
		14-Jan-21	BH107	Normal	ES2101242	<0.5	<0.02	<0.02	<0.005	<10
		11-Feb-21	BH107	Normal	ES2104999	<0.5	<0.02	<0.02	<0.005	<10
		10-Mar-21	BH107	Normal	ES2108508	<0.5	<0.02	<0.02	<0.005	<10
		07-Apr-21	BH107	Normal	ES2112804	<0.5	<0.02	<0.02	<0.005	<10
		03-May-21	BH107	Normal	ES2116634	<0.5	<0.02	<0.02	<0.005	<10
		08-Jun-21	BH107	Normal	ES2121745	<0.5	<0.02	<0.02	<0.005	<10
		07-Jul-21	BH107	Normal	ES2125048	<0.5	<0.02	<0.02	<0.005	<10
		13-Aug-21	BH107	Normal	ES2129596	<0.5	<0.02	<0.02	<0.005	<10
		01-Sep-21	BH107	Normal	ES2131753	<0.5	<0.02	<0.02	<0.005	<10
		15-Oct-21	GWDP2	Interlab D	833147					
		15-Oct-21	BH107	Normal	ES2137338	<0.5	<0.02	<0.02	<0.005	<10
		08-Nov-21	BH107	Normal	ES2140334	<0.5	<0.02	<0.02	<0.005	<10
		08-Dec-21	GWDP2	Interlab D	849475					
		08-Dec-21	BH107	Normal	ES2144782	<0.5	<0.02	<0.02	<0.005	<10
		13-Jan-22	BH107	Normal	ES2201179	<0.5	<0.02	<0.02	<0.005	<10
		10-Feb-22	BH107	Normal	ES2204606	<0.5	<0.02	<0.02	<0.005	<10
		18-Mar-22	BH107	Normal	ES2209694	<0.5	<0.02	<0.02	<0.005	<10
		25-May-22	Field D	ES2209694						
		25-May-22	BH107	Normal	ES2218210	<0.5	<0.02	<0.02	<0.005	<10
		27-Jun-22	BH107	Normal	ES22222571	<0.5	<0.02	<0.02	<0.005	<10
		20-Jul-22	BH107	Normal	ES2225656	<0.5	<0.02	<0.02	<0.005	<10
	BH112	18-Jul-19	BH112	Normal	ES19222601	<0.5	<0.02	<0.02	<0.005	<10
		20-Aug-19	BH112	Normal	ES1926460	<0.5	<0.02	<0.02	<0.005	<10
		25-Sep-19	BH112	Normal	ES1931244	<0.5	<0.02	<0.02	<0.005	<10
		22-Oct-19	BH112	Normal	ES1934707	<0.5	<0.02	<0.02	<0.005	<10
		07-Nov-19	BH112	Normal	ES1936840	<0.5	<0.02	<0.02	<0.005	<10
		12-Dec-19	BH112	Normal	ES1941279	<0.5	<0.02	<0.02	<0.005	<10
		20-Feb-20	BH112	Normal	ES2005947	<0.5	<0.02	<0.02	<0.005	<10
		21-Apr-20	BH112	Normal	ES2013464	<0.5	<0.02	<0.02	<0.005	<10
		21-May-20	BH112	Normal	ES2017665	<0.5	<0.02	<0.02	<0.005	<10
		30-Jul-20	BH112	Normal	ES2026408	<0.5	<0.02	<0.02	<0.005	<10
		13-Aug-20	BH112	Normal	ES2028325	<0.5	<0.02	<0.02	<0.005	<10
		10-Sep-20	BH112	Normal	ES2032115	<0.5	<0.02	<0.02	<0.005	<10
		09-Oct-20	BH112	Normal	ES2035519	<0.5	<0.02	<0.02	<0.005	<10
		08-Dec-20	BH112	Normal	ES2043799	<0.5	<0.02	<0.02	<0.005	<10
		14-Jan-21	BH112	Normal	ES2101242	<0.5	<0.02	<0.02	<0.005	<10
		11-Feb-21	BH112	Normal	ES2104999	<0.5	<0.02	<0.02	<0.005	<10
		10-Mar-21	BH112	Normal	ES2108508	<0.5	<0.02	<0.02	<0.005	<10
		07-Apr-21	BH112	Normal	ES2112804	<0.5	<0.02	<0.02	<0.005	<10
		04-May-21	BH112	Normal	ES2116634	<0.5	<0.02	<0.02	<0.005	<10
		08-Jun-21	BH112	Normal	ES2121745	<0.5	<0.02	<0.02	<0.005	<10
		07-Jul-21	BH112	Normal	ES2125048	<0.5	<0.02	<0.02	<0.005	<10
		13-Aug-21	BH112	Normal	ES2129596	<0.5	<0.02	<0.02	<0.005	<10
		07-Sep-21	BH112	Normal	ES2137338	<0.5	<0.02	<0.02	<0.005	<10
		15-Oct-21	BH112	Normal	ES2137338	<0.5	<0.02	<0.02	<0.005	<10
		08-Nov-21	BH112	Normal	ES2140334	<0.5	<0.02	<0.02	<0.005	<10
		08-Dec-21	BH112	Normal	ES2144782	<0.5	<0.02	<0.02	<0.005	<10
		13-Jan-22	BH112	Normal	ES2201179	<0.5	<0.02	<0.02	<0.005	<10
		10-Feb-22	BH112	Normal	ES2204606	<0.5	<0.02	<0.02	<0.005	<10
		18-Mar-22	BH112	Normal	ES2209694	<0.5	<0.02	<0.02	<0.005	<10
		25-May-22	BH112	Normal	ES2209694	<0.5	<0.02	<0.02	<0.005	<10
		25-May-22	BH112	Normal	ES2218210	<0.5	<0.02	<0.02	<0.005	<10
		27-Jun-22	BH112	Normal	ES22222571	<0.5	<0.02	<0.02	<0.005	<10
		20-Jul-22	BH112	Normal	ES2225656	<0.5	<0.02	<0.02	<0.005	<10
		18-Jul-19	BH112	Normal	ES19222601	<0.5	<0.02	<0.02	<0.005	<10
		20-Aug-19	BH112	Normal	ES1926460	<0.5	<0.02	<0.02	<0.005	<10
		25-Sep-19	BH112	Normal	ES1931244	<0.5	<0.02	<0.02	<0.005	<10
		22-Oct-19	BH112	Normal	ES1934707	<0.5	<0.02	<0.02	<0.005	<10
		07-Nov-19	BH112	Normal	ES1936840	<0.5	<0.02	<0.02	<0.005	<10
		12-Dec-19	BH112	Normal	ES1941279	<0.5	<0.02	<0.02	<0.005	<10
		20-Feb-20	BH112	Normal	ES2005947	<0.5	<0.02	<0.02	<0.005	<10
		21-Apr-20	BH112	Normal	ES2013464	<0.5	<0.02	<0.02	<0.005	<10
		21-May-20	BH112	Normal	ES2017665	<0.5	<0.02	<0.02	<0.005	<10
		30-Jul-20	BH112	Normal	ES2026408	<0.5	<0.02	<0.02	<0.005	<10
		13-Aug-20	BH112	Normal	ES2028325	<0.5	<0.02	<0.02	<0.005	<10
		10-Sep-20	BH112	Normal	ES2032115	<0.5	<0.02	<0.02	<0.005	<10
		09-Oct-20	BH112	Normal	ES2035519	<0.5	<0.02	<0.02	<0.005	<10
		08-Dec-20	BH112	Normal	ES2043799	<0.5	<0.02	<0.02	<0.005	<10
		14-Jan-21	BH112	Normal	ES2101242	<0.5	<0.02	<0.02	<0.005	<10
		11-Feb-21	BH112	Normal	ES2104999	<0.5	<0.02	<0.02	<0.005	<10
		10-Mar-21	BH112	Normal	ES2108508	<0.5	<0.02	<0.02	<0.005	<10
		07-Apr-21	BH112	Normal	ES2112804	<0.5	<0.02	<0.02	<0.005	<10
		04-May-21	BH112	Normal	ES2116634	<0.5	<0.02	<0.02	<0.005	<10
		08-Jun-21	BH112	Normal	ES2121745	<0.5	<0.02	<0.02	<0.005	<10
		07-Jul-21	BH112	Normal	ES2125048	<0.5	<0.02	<0.02	<0.005	<10
		13-Aug-21	BH112	Normal	ES2129596	<0.5	<0.02	<0.02	<0.005	<10
		07-Sep-21	BH112	Normal	ES2137338	<0.5	<0.02	<0.02	<0.005	<10
		15-Oct-21	BH112	Normal	ES2137338	<0.5	<0.02	<0.02	<0.005	<10
		08-Nov-21	BH112	Normal	ES2140334	<0.5	<0.02	<0.02	<0.005	<10
		08-Dec-21	BH112	Normal	ES2144782	<0.5	<0.02	<0.02	<0.005	<10
		13-Jan-22	BH112	Normal	ES2201179	<0.5	<0.02	<0.02	<0.005	<10
		10-Feb-22	BH112	Normal	ES2204606	<0.5	<0.02	<0.02	<0.005	<10
		18-Mar-22	BH112	Normal	ES2209694	<0.5	<0.02	<0.02	<0.005	<10
		25-May-22	BH112	Normal	ES2209694	<0.5	<0.02	<0.02	<0.005	<10
		25-May-22	BH112	Normal	ES2218210	<0.5	<0.02	<0.02	<0.005	<10
		27-Jun-22	BH112	Normal	ES22222571	<0.5	<0.02	<0.02	<0.005	<10
		20-Jul-22	BH112	Normal	ES2225656	<0.5	<0.02	<0.02	<0.005	<10
		18-Jul-19	BH112	Normal	ES19222601	<0.5	<0.02	<0.02	<0.005	<10
		20-Aug-19	BH112	Normal	ES1926460	<0.5	<0.02	<0.02	<0.005	<10
		25-Sep-19	BH112	Normal	ES1930997	<0.5	<0.02	<0.02	<0.005	<10
		22-Oct-19	BH112	Normal	ES1934707	<0.5	<0.02	<0.02	<0.005	<10
		07-Nov-19	BH112	Normal	ES1936840	<0.5	<0.02	<0.02	<0.005	<10
		12-Dec-19	BH112	Normal	ES1941279	<0.5	<0.02	<0.02	<0.005	<10
		20-Feb-20	BH112	Normal	ES2005947	<0.5	<0.02	<0.02	<0.005	<10
		23-Apr-20	BH112	Normal	ES2013858	<0.5	<0.02	<0.02	<0.005	<10
		21-May-20	BH112	Normal	ES2017665	<0.5	<0.02	<0.02	<0.005	<10
		30-Jul-20	BH112	Normal	ES2026408	<0.5	<0.02	<0.02	<0.005	<10
		11-Aug-20	BH112	Normal	ES2027951	<0.5	<0.02	<0.02	<0.005	<10
		10-Sep-20	BH112	Normal	ES2032115	<0.5	<0.02	<0.02	<0.005	<10
		09-Oct-20	BH112	Normal	ES2035519	<0.5	<0.02	<0.02	<0.005	<10
		08-Dec-20	BH112	Normal	ES2043799	<0.5	<0.02	<0.02	<0.005	<10
		14-Jan-21	BH112	Normal	ES2101242	<0.5	<0.02	<0.02	<0.005	<10
		11-Feb-21	BH112	Normal	ES2104999	<0.5	<0.02	<0.02	<0.005	<10
		10-Mar-21	BH112	Normal	ES2108508	<0.5	<0.02	<0.02	<0.005	<10
		07-Apr-21	BH112	Normal	ES2112804	<0.5	<0.02	<0.02	<0.005	<10
		04-May-21	BH112	Normal	ES2116634	<0.5	<0.02	<0.02	<0.005	<10
		08-Jun-21	BH112	Normal	ES2121745	<0.5	<0.02	<0.02	<0.00	

EQI	ADWG 2011 Health (V3.7 updated 2022)	0.5	0.02	0.02	20	0.02	0.02	0.005	10	100
	ANZECC 2000 - Lowland Rivers (NSW coastal rivers)	8		50	400	7				
	ANZECC 2000 - Stock Watering									
	ANZG (2018) - FW - 95% (updated 26 July 2021)									
	NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand									
	2-4m									
	4-8m									
	>8m									
Pesticides	Acephate	µg/L								
	Demeton-O & Demeton-S	µg/L								
	Formothion	µg/L								
	Temephos	µg/L								
	Trichlorfon	µg/L								
	Triazophos	µg/L								
Fungicides	Fosetyl-al	µg/L								
Herbicides	Dinoseb	µg/L								

		M12 - Central										M12 - West																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
BH145	08-Nov-21	BH112	Normal	ES21440334	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Transport for NSW
M12 Motorway
Ground Water Monitoring Program

Pesticides	Acophate	µg/L	0.5	8	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 - Lowland Rivers (NSW coastal rivers)	ANZEC (2018) - FW - 95% (updated 26 July 2021)	ANZECC 2000 - Stock Watering	NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand	>8m
	Demeton-O & Demeton-S	µg/L	0.02	50						2-4m
	Formothion	µg/L	20	400						4-8m
	Temephos	µg/L	0.02	7						
	Trichlorfon	µg/L	0.02							
	Triazophos	µg/L	0.005							
	Fosetyl-al	µg/L	10							
	Dinoseb	µg/L	100							
	Fungicides									
	Herbicides									

Number of Results	37	37	37	37	37
Minimum Concentration	<0.5	<0.02	<0.02	<0.02	<0.02
Minimum Detect	ND	ND	ND	ND	ND
Maximum Concentration	<0.5	<0.02	<0.02	<0.02	<0.02
Maximum Detect	ND	ND	ND	ND	ND
Average Concentration	0.25	0.01	0.01	0.01	0.0026
Geometric Average	0.25	0.01	0.01	0.01	0.0026
Median Concentration	0.25	0.01	0.01	0.01	0.0025
Standard Deviation	0	0	0	0	0
Geometric Standard Deviation					
Number of Guideline Exceedances	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0
% of Results at or above the Detect Limit	0	0	0	0	0
% of Results below the Detect Limit	100	100	100	100	100
% of Detects at or above Guidelines	0	0	0	0	0
% of Results Below Guidelines or Non-Detect	100	100	100	100	100

Reported Analyte LOR	Requested Analyte LOR	Comments
#1: Not specifically guideline value (>500mg/L can have purgative effects	#1: Reported Analyte LOR is higher than Requested Analyte LOR	#1: Not specifically guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
#2: Guideline value calculated by dividing Nitrate (as Nitrate) value (0.3 mg/L) by molecular weight (3.296703).		#2: Guideline value calculated by dividing Nitrate (as Nitrate) value (0.3 mg/L) by molecular weight (3.296703).
#3: Guideline value calculated by dividing Nitrate (as Nitrate) value (0.3 mg/L) by molecular weight (3.296703).		#3: Guideline value calculated by dividing Nitrate (as Nitrate) value (0.3 mg/L) by molecular weight (3.296703).
#4: Calculated from ammonia NH4		#4: Calculated from ammonia NH4
#5: Loss of production expected at 5000 mg/L for beef cattle, 4000 mg/L dairy cattle, 10000 mg/L sheep, 6000 mg/L horses and pigs, 3000 mg/L poultry		#5: Loss of production expected at 5000 mg/L for beef cattle, 4000 mg/L dairy cattle, 10000 mg/L sheep, 6000 mg/L horses and pigs, 3000 mg/L poultry
#6: 400 mg/L divided by molecular weight, stock may tolerate higher nitrate concentrations if nitrate in feed are not high, water containing >1500 mg/L (as NO3) is likely to be toxic.		#6: 400 mg/L divided by molecular weight, stock may tolerate higher nitrate concentrations if nitrate in feed are not high, water containing >1500 mg/L (as NO3) is likely to be toxic.
#7: 30 mg/L divided by molecular weight		#7: 30 mg/L divided by molecular weight
#8: >0.5 mg/L hazardous to sheep, >1 mg/L for cattle, >5 mg/L pigs and poultry		#8: >0.5 mg/L hazardous to sheep, >1 mg/L for cattle, >5 mg/L pigs and poultry
#9: Measured as NH3-N at pH 8		#9: Measured as NH3-N at pH 8
#10: Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"		#10: Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
#11: In absence of total As guideline, As (V) guideline has been adopted.		#11: In absence of total As guideline, As (V) guideline has been adopted.
#12: In absence of total Cr guideline, Cr (VI) guideline has been adopted.		#12: In absence of total Cr guideline, Cr (VI) guideline has been adopted.
#13: Not limiting: Derived water HSL exceeds water solubility limit		#13: Not limiting: Derived water HSL exceeds water solubility limit
#14: To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.		#14: To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.

Data Comments
#1 Reported Analyte LOR is higher than Requested Analyte LOR

#14: To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.

#13:Not limiting: Derived water HSL exceeds water solubility limit

#12: In absence of total Cr guideline, Cr (VI) guideline has been adopted.

#10: Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
#11: In absence of total As (V) guideline has been adopted.

#9: Measured as $\text{NH}_3\text{-N}$ at pH 8

#8:>0.5 mg/L hazardous to sheep, >1 mg/L for cattle, >5 mg/L pigs and poultry

#7.39 mg/L divided by molecular weight

#6:400 mg/L divided by molecular weight, stock may tolerate higher nitrate concentrations if nitrate in feed are not high, water containing >500 mg/L (as NO3) is likely to be toxic.

#4: Calculated from ammonia NH₄

#3: Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).

#2: Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427

Env Stds Comments



Appendix B
Table B3
Analytical Results for Construction Monitoring Period (August 2022 to March 2024)

Transport for NSW
M12 Motorway
Groundwater Monitoring Program

	Inorganics		Acidity & Alkalinity			Major Ions								Minor Ions		Nutrients								Metals											
	Total Dissolved Solids	Total Suspended Solids	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Hardness as CaCO3 (filtered)	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Sodium (filtered)	Chloride	Sulfate (filtered)	Cations Total	Anions Total	Ionic Balance	Bicarbonate ion (HCO3-)	Carbonate ion	Ammonia as N	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total Oxidised) (as N)	Nitrogen (Total)	Kjeldahl Nitrogen Total	Reactive Phosphorus as P	Phosphorus (Total)	Arsenic (filtered)	Cadmium (filtered)	Chromium (III+VI) (filtered)	Copper (filtered)	Iron (filtered)	Lead (filtered)	Manganese (filtered)	Mercury (filtered)	Nickel (filtered)	Zinc (filtered)	
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
EQL	10	5	1	1	1	1	1	1	1	1	1	0.01	0.01	0.01	1	1	0.01	0.01	0.01	0.01	0.1	0.1	0.01	0.01	0.001	0.0001	0.001	0.001	0.05	0.001	0.001	0.0001	0.001	0.001	0.005
ADWG 2011 Health (v3.7 updated 2022)											500 ^{#1}							11.29 ^{#2}	0.91 ^{#3}						0.01	0.002		2		0.01	0.5	0.001	0.02		
ANZECC 2000 - Lowland Rivers (NSW coastal rivers)		6															0.01165 ^{#4}			0.04	0.35		0.008	0.025											
ANZECC 2000 - Stock Watering	5000 ^{#5}					1000					1000							90 ^{#6}	9.1 ^{#7}						0.5	0.01	1	1 ^{#8}		0.1		0.002	1	20	
ANZG (2018) - FW - 95% (updated 26 July 2021)																	0.9 ^{#9}	2.4 ^{#10}							0.013 ^{#11}	0.0002	0.001 ^{#12}	0.0014		0.0034	1.9	0.0006	0.011	0.008	
NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand																																			
>=2m, <4m																																			
>=4m, <8m																																			
>=8m																																			

Package	Location	Date	Field ID	Sample Type	Lab Report																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											



Appendix B

Table B3

Analytical Results for Construction Monitoring Period (August 2022 to March 2024)

	Inorganics		Acidity & Alkalinity			Major Ions								Minor Ions		Nutrients							Metals												
	Total Dissolved Solids	Total Suspended Solids	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Hardness as CaCO3 (filtered)	Caicium (filtered)	Magnesium (filtered)	Potassium (filtered)	Sodium (filtered)	Chloride	Sulfate (filtered)	Cations Total	Anions Total	Ionic Balance	Bicarbonate ion (HCO3-)	Carbonate ion	Ammonia as N	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total Oxidised) (as N)	Nitrogen (Total)	Kjeldahl Nitrogen Total	Reactive Phosphorus as P	Phosphorus (Total)	Arsenic (filtered)	Cadmium (filtered)	Chromium (III+VI) (filtered)	Copper (filtered)	Iron (filtered)	Lead (filtered)	Manganese (filtered)	Mercury (filtered)	Nickel (filtered)	Zinc (filtered)	
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
EQL	10	5	1	1	1	1	1	1	1	1	1	0.01	0.01	0.01	1	1	0.01	0.01	0.01	0.01	0.1	0.1	0.1	0.01	0.01	0.001	0.0001	0.001	0.001	0.05	0.001	0.001	0.0001	0.001	0.001
ADWG 2011 Health (v3.7 updated 2022)											500 ^{#1}							11.29 ^{#2}	0.91 ^{#3}						0.01	0.002		2		0.01	0.5	0.001	0.02		
ANZECC 2000 - Lowland Rivers (NSW coastal rivers)		6															0.01165 ^{#4}			0.04	0.35		0.008	0.025											
ANZECC 2000 - Stock Watering	5000 ^{#5}					1000					1000							90 ^{#6}	9.1 ^{#7}						0.5	0.01	1	1 ^{#8}		0.1		0.002	1	20	
ANZG (2018) - FW - 95% (updated 26 July 2021)																	0.9 ^{#9}	2.4 ^{#10}							0.013 ^{#11}	0.0002	0.001 ^{#12}	0.0014		0.0034	1.9	0.0006	0.011	0.008	
NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand																																			
>=2m, <4m																																			
>=4m, <8m																																			
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Package	Location	Date	Field ID	Sample Type	Lab Report																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											

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Number of Results	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69



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Table B3
Analytical Results for Construction Monitoring Period (August 2022 to March 2024)

Transport for NSW
M12 Motorway
Groundwater Monitoring Program

	BTEXN								TRH - NEPM 2013							TRH - NEPM 1999					PAHs - standard 16												
	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	BTEX (Sum of Total) - Lab Calc	Naphthalene (BTEXN suite)	F1 (C6-C10 minus BTEX)	C6-C10 Fraction	F2 (>C10-C16 minus Naphthalene)	>C10-C16 Fraction	F3 (>C16-C34 Fraction)	F4 (>C34-C40 Fraction)	>C10-C40 (Sum of Total)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 (Sum of Total)	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo[b+g]fluoranthene	Benzo(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene		
EQL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		
ADWG 2011 Health (v3.7 updated 2022)	0.001	0.8	0.3	0.002	0.002	0.6	0.001	0.005	0.02	0.02	0.1	0.1	0.1	0.1	0.1	0.02	0.05	0.1	0.05	0.05	0.001	0.001	0.001	0.001	0.0005	0.001	0.001	0.001	0.001	0.001	0.001		
ANZECC 2000 - Lowland Rivers (NSW coastal rivers)																																	
ANZECC 2000 - Stock Watering																																	
ANZG (2018) - FW - 95% (updated 26 July 2021)	0.95	0.18	0.08	0.35				0.016															0.0004		0.0002						0.0014		
NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand																																	
>=2m, <4m	5	NL ^{#13}	NL ^{#13}			NL ^{#13}		NL ^{#13}	6 ^{#14}		NL ^{#13}																						
>=4m, <8m	5	NL ^{#13}	NL ^{#13}			NL ^{#13}		NL ^{#13}	6 ^{#14}		NL ^{#13}																						
>=8m	5	NL ^{#13}	NL ^{#13}			NL ^{#13}		NL ^{#13}	7 ^{#14}		NL ^{#13}																						

Package	Location	Date	Field ID	Sample Type	Lab Report																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			



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Table B3

Analytical Results for Construction Monitoring Period (August 2022 to March 2024)

	BTEXN								TRH - NEPM 2013							TRH - NEPM 1999					PAHs - standard 16												
	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	BTEX (Sum of Total) - Lab Calc	Naphthalene (BTEXN suite)	F1 (O6-C10 minus BTEX)	C6-C10 Fraction	F2 (>C10-C16 minus Naphthalene)	>C10-C16 Fraction	F3 (>C16-C34 Fraction)	F4 (>C34-C40 Fraction)	>C10-C40 (Sum of Total)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 (Sum of Total)	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo[b+]/fluoranthene	Benzo(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene		
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		
EQL	0.001	0.002	0.002	0.002	0.002	0.002	0.001	0.005	0.02	0.02	0.1	0.1	0.1	0.1	0.1	0.02	0.05	0.1	0.05	0.05	0.001	0.001	0.001	0.001	0.0005	0.001	0.001	0.001	0.001	0.001	0.001	0.001	
ADWG 2011 Health (v3.7 updated 2022)	0.001	0.8	0.3			0.6																			0.00001								
ANZECC 2000 - Lowland Rivers (NSW coastal rivers)																																	
ANZECC 2000 - Stock Watering																																	
ANZG (2018) - FW - 95% (updated 26 July 2021)	0.95	0.18	0.08	0.35				0.016															0.0004		0.0002							0.0014	
NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand																																	
>=2m, <4m	5	NL ^{#13}	NL ^{#13}			NL ^{#13}		NL ^{#13}	6 ^{#14}		NL ^{#13}																						
>=4m, <8m	5	NL ^{#13}	NL ^{#13}			NL ^{#13}		NL ^{#13}	6 ^{#14}		NL ^{#13}																						
>=8m	5	NL ^{#13}	NL ^{#13}			NL ^{#13}		NL ^{#13}	7 ^{#14}		NL ^{#13}																						

Package	Location	Date	Field ID	Sample Type	Lab Report																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											

Statistics																																		
Number of Results	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71		
Number of Detects	2	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Minimum Concentration	0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.05	<0.05	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Minimum Detect	0.001	0.003	ND	ND	ND	ND	0.004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	0.001	0.003	<0.002	<0.002	<0.002	<0.002	0.004	<0.005	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.05	<0.05	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Maximum Detect	0.001	0.003	ND	ND	ND	ND	0.004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	0.00051	0.0011	0.001	0.001	0.001	0.001	0.0006	0.0025	0.01	0.01	0.05	0.05	0.05	0.05	0.05	0.01	0.025	0.05	0.025	0.025	0.0005	0.0005	0.0005	0.0005	0.00025	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
Median Concentration *	0.0005	0.001	0.001	0.001	0.001	0.001	0.0005	0.0025	0.01	0.01	0.05	0.05	0.05	0.05	0.05	0.01	0.025	0.05	0.025	0.025	0.0005	0.0005	0.0005	0.0005	0.00025	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
Standard Deviation *	0.000083	0.00033	0	0	0	0	0.00058	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
95% UCL (Student's-t) *	0.00053	0.00112	0.001	0.001	0.001	0.001	0.0007	0.0025	0.01	0.01	0.05	0.05	0.05	0.05	0.05	0.01	0.025	0.05	0.025	0.025	0.0005	0.0005	0.0005	0.0005	0.00025	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	



Appendix B
Table B3
Analytical Results for Construction Monitoring Period (August 2022 to March 2024)

Transport for NSW
M12 Motorway
Groundwater Monitoring Program

	PAHs - standard 16							Phenols - Halogenated							Phenols - Non-Halogenated				
	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene-PAH	Phenanthrene	Pyrene	PAHs (Sum of total) - Lab calc	Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	2-Chlorophenol	2,4-Dichlorophenol	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,6-Dichlorophenol	4-Chloro-3-methylphenol	Pentachlorophenol	Phenol	2-Nitrophenol	2-Methylphenol (o-Cresol)	3,4-Methylphenol (m,p-cresol)	2,4-Dimethylphenol
EQL	0.001	0.001	0.001	0.001	0.001	0.0005	0.0005	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.001
ADWG 2011 Health (v3.7 updated 2022)						0.00001		0.3	0.2		0.02			0.01					
ANZECC 2000 - Lowland Rivers (NSW coastal rivers)																			
ANZECC 2000 - Stock Watering																			
ANZG (2018) - FW - 95% (updated 26 July 2021)			0.016	0.002				0.49	0.16		0.02			0.01	0.32				
NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand																			
>=2m, <4m			NL ^{#13}																
>=4m, <8m			NL ^{#13}																
>=8m			NL ^{#13}																

Package	Location	Date	Field ID	Sample Type	Lab Report																				
M12 - West	BH104	15 Aug 2022	BH104	Normal	ES22229015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
			GWDUP1	Field_D	ES22229015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		19 Sep 2022	BH104	Normal	ES2233729	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
			GWDUP1	Field_D	ES2233729	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		20 Oct 2022	BH104	Normal	ES2237811	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		16 Nov 2022	BH104	Normal	ES2241428	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		GWDUP1	Field_D	ES2241428	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	BH104R	16 Dec 2022	BH104R	Normal	ES2245760	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP2	Interlab_D	951385	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		18 Jan 2023	BH104R	Normal	ES2301690	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP1	Field_D	ES2301690	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP2	Interlab_D	957071	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		08 Feb 2023	BH104R	Normal	ES2304063	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP1	Field_D	ES2304063	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP2	Interlab_D	962102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		03 Mar 2023	BH104R	Normal	ES2307153	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP1	Field_D	ES2307153	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		04 Apr 2023	BH104R	Normal	ES2311426	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP1	Field_D	ES2311426	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		02 May 2023	BH104R	Normal	ES2314383	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP1	Field_D	ES2314383	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		07 Jun 2023	BH104R	Normal	ES2319027	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP2	Interlab_D	997826	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		07 Jul 2023	BH104R	Normal	ES2322790	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP2	Interlab_D	1006932	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		09 Aug 2023	BH104R	Normal	ES2326796	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP1	Field_D	ES2326796	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		05 Sep 2023	BH104R	Normal	ES2330598	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP2	Interlab_D	1024024	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		06 Oct 2023	BH104R	Normal	ES2334429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		08 Nov 2023	BH104R	Normal	ES2338893-AF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		06 Dec 2023	BH104R	Normal	ES2342531	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		19 Jan 2024	BH104R	Normal	ES2401985	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020	<0.0010
			GWDUP2	Interlab_D	1061811	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		13 Feb 2024	BH104R	Normal	ES2404914	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		15 Mar 2024	BH104R	Normal	ES2408629	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		BH107	15 Aug 2022	BH107	Normal	ES22229015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	19 Sep 2022		BH107	Normal	ES2233729	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20 Oct 2022		BH107	Normal	ES2237811	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP2	Interlab_D	934854	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	16 Nov 2022		BH107	Normal	ES2241428	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP2	Interlab_D	941927	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Appendix B
Table B3
Analytical Results for Construction Monitoring Period (August 2022 to March 2024)

Transport for NSW
M12 Motorway
Groundwater Monitoring Program

	PAHs - standard 16							Phenols - Halogenated							Phenols - Non-Halogenated				
	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene-PAH	Phenanthrene	Pyrene	PAHs (Sum of total) - Lab calc	Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	2-Chlorophenol	2,4-Dichlorophenol	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,6-Dichlorophenol	4-Chloro-3-methylphenol	Pentachlorophenol	Phenol	2-Nitrophenol	2-Methylphenol (o-Cresol)	3,4-Methylphenol (m,p-cresol)	2,4-Dimethylphenol
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL	0.001	0.001	0.001	0.001	0.001	0.0005	0.0005	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.001
ADWG 2011 Health (v3.7 updated 2022)						0.00001		0.3	0.2		0.02			0.01					
ANZECC 2000 - Lowland Rivers (NSW coastal rivers)																			
ANZECC 2000 - Stock Watering																			
ANZG (2018) - FW - 95% (updated 26 July 2021)			0.016	0.002				0.49	0.16		0.02			0.01	0.32				
NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand																			
>=2m, <4m			NL ^{#13}																
>=4m, <8m			NL ^{#13}																
>=8m			NL ^{#13}																

Package	Location	Date	Field ID	Sample Type	Lab Report																			
M12 - West	BH107R	16 Dec 2022	BH107R	Normal	ES2245760	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
			GWDUP1	Field_D	ES2245760	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		08 Feb 2023	BH107R	Normal	ES2304063	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		03 Mar 2023	BH107R	Normal	ES2307153	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
			GWDUP2	Interlab_D	969408	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		04 Apr 2023	BH107R	Normal	ES2311426	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		05 Apr 2023	GWDUP2	Interlab_D	979752	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		02 May 2023	BH107R	Normal	ES2314383	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
			GWDUP2	Interlab_D	986190	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		07 Jul 2023	BH107R	Normal	ES2322790	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
			GWDUP1	Field_D	ES2322790	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		09 Aug 2023	BH107R	Normal	ES2326796	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
			GWDUP2	Interlab_D	1015966	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		05 Sep 2023	BH107R	Normal	ES2330598	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
			GWDUP1	Field_D	ES2330598	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		06 Oct 2023	BH107R	Normal	ES2334429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
			GWDUP2	Interlab_D	1033274	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		08 Nov 2023	BH107R	Normal	ES2338893-AF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
			GWDUP2	Interlab_D	1043528	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		06 Dec 2023	BH107R	Normal	ES2342531	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		19 Jan 2024	BH107R	Normal	ES2401985	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010	<0.0020	<0.0010
		13 Feb 2024	BH107R	Normal	ES2404914	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP2	Interlab_D	1069861	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		15 Mar 2024	BH107R	Normal	ES2408629	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	BH112	15 Aug 2022	BH112	Normal	ES2229015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
			GWDUP2	Interlab_D	915049	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		19 Sep 2022	BH112	Normal	ES2233729	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
			GWDUP2	Interlab_D	925349	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		20 Oct 2022	BH112	Normal	ES2237811	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
			GWDUP1	Field_D	ES2237811	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	16 Nov 2022	BH112	Normal	ES2241428	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	BH112R	09 Aug 2023	BH112R	Normal	ES2326796	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
			BH112R	Normal	ES2330598	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		06 Oct 2023	BH112R	Normal	ES2334429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
			GWDUP1	Field_D	ES2334429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		08 Nov 2023	BH112R	Normal	ES2338893-AF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
			GWDUP1	Field_D	ES2338893-AF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		06 Dec 2023	BH112R	Normal	ES2342531	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
			BH112R	Normal	ES2401985	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010	<0.0020	<0.0010
		13 Feb 2024	BH112R	Normal	ES2404914	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
			GWDUP1	Field_D	ES2404914	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		15 Mar 2024	BH112R	Normal	ES2408629	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



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Transport for NSW
M12 Motorway
Groundwater Monitoring Program

	PAHs - standard 16							Phenols - Halogenated							Phenols - Non-Halogenated				
	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene-PAH	Phenanthrene	Pyrene	PAHs (Sum of total) - Lab calc	Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	2-Chlorophenol	2,4-Dichlorophenol	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,6-Dichlorophenol	4-Chloro-3-methylphenol	Pentachlorophenol	Phenol	2-Nitrophenol	2-Methylphenol (o-Cresol)	3,4-Methylphenol (m,p-cresol)	2,4-Dimethylphenol
EQL	0.001	0.001	0.001	0.001	0.001	0.0005	0.0005	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.001
ADWG 2011 Health (v3.7 updated 2022)						0.00001		0.3	0.2		0.02			0.01					
ANZECC 2000 - Lowland Rivers (NSW coastal rivers)																			
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ANZG (2018) - FW - 95% (updated 26 July 2021)			0.016	0.002				0.49	0.16		0.02			0.01	0.32				
NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand																			
>=2m, <4m			NL ^{#13}																
>=4m, <8m			NL ^{#13}																
>=8m			NL ^{#13}																

Package	Location	Date	Field ID	Sample Type	Lab Report																			
M12 - Central	BH144	15 Nov 2022	BH144	Normal	ES2241428	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	BH145	15 Aug 2022	BH145	Normal	ES2229015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		19 Sep 2022	BH145	Normal	ES2233729	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		20 Oct 2022	BH145	Normal	ES2237811	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		15 Nov 2022	BH145	Normal	ES2241428	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		14 Dec 2022	BH145	Normal	ES2245760	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		17 Jan 2023	BH145	Normal	ES2301690	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		07 Feb 2023	BH145	Normal	ES2304063	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		02 Mar 2023	BH145	Normal	ES2307153	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	BH145R	05 Apr 2023	BH145R	Normal	ES2311426	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		02 May 2023	BH145R	Normal	ES2314383	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		06 Jun 2023	BH145R	Normal	ES2319027	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
			GWDUP1	Field_D	ES2319027	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		07 Jul 2023	BH145R	Normal	ES2322790	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		09 Aug 2023	BH145R	Normal	ES2326796	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		06 Sep 2023	BH145R	Normal	ES2330598	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		06 Oct 2023	BH145R	Normal	ES2334429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		09 Nov 2023	BH145R	Normal	ES2338893-AF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		05 Dec 2023	BH145R	Normal	ES2342531	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		19 Jan 2024	BH145R	Normal	ES2401985	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010	<0.0020	<0.0010
			GWDUP1	Field_D	ES2401985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		14 Feb 2024	BH145R	Normal	ES2404914	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		14 Mar 2024	BH145R	Normal	ES2408629	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Statistics																						
Number of Results	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	0.0005	0.0005	0.0005	0.0005	0.0005	0.00025	0.00025	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.0005	0.0005	0.0005	0.001	0.0005	0.0005	0.0005
Median Concentration *	0.0005	0.0005	0.0005	0.0005	0.0005	0.00025	0.00025	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.0005	0.0005	0.0005	0.001	0.0005	0.0005	0.0005
Standard Deviation *	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95% UCL (Student's-t) *	0.0005	0.0005	0.0005	0.0005	0.0005	0.00025	0.00025	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.0005	0.0005	0.0005	0.001	0.0005	0.0005	0.0005

* A Non Detect Multiplier of 0.5 has been applied.

Comments

- #1 Not specifically guideline value: >500mg/L can have purgative effects
#2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
#3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
#4 Calculated from ammonia NH4
#5 Loss of production expected at 5000 mg/L for beef cattle, 4000 mg/L dairy cattle, 10000 mg/L sheep, 6000 mg/L horses and pigs, 3000 mg/L poultry
#6 400 mg/L divided by molecular weight, stock may tolerate higher nitrate concentrations if nitrate in feed are not high, water containing >1500 mg/L (as NO3) is likely to be toxic.
#7 30 mg/L divided by molecular weight
#8 >0.5 mg/L hazardous to sheep, >1 mg/L for cattle, >5 mg/L pigs and poultry
#9 Measured as NH3-N at pH 8
#10 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
#11 In absence of total As guideline, As (V) guideline has been adopted.
#12 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
#13 Not limiting: Derived water HSL exceeds water solubility limit
#14 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.
#15 Reported Analyte LOR is higher than Requested Analyte LOR

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)





Appendix B

Table B4

Analytical Results for Current Monitoring Period (October 2023 to March 2024)

Transport for NSW

M12 Motorway

Groundwater Monitoring Program

	Inorganics		Acidity & Alkalinity			Major Ions									Minor Ions		Nutrients								Metals											
	Total Dissolved Solids	Total Suspended Solids	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Hardness as CaCO3 (filtered)	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Sodium (filtered)	Chloride	Sulfate (filtered)	Cations Total	Anions Total	Ionic Balance	Bicarbonate ion (HCO3-)	Carbonate ion	Ammonia as N	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total Oxidised) (as N)	Nitrogen (Total)	Kjeldahl Nitrogen Total	Reactive Phosphorus as P	Phosphorus (Total)	Arsenic (filtered)	Cadmium (filtered)	Chromium (III+VI) (filtered)	Copper (filtered)	Iron (filtered)	Lead (filtered)	Manganese (filtered)	Mercury (filtered)	Nickel (filtered)	Zinc (filtered)		
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		
EQL	10	5	1	1	1	1	1	1	1	1	1	0.01	0.01	0.01	1	1	0.01	0.01	0.01	0.01	0.1	0.1	0.01	0.01	0.001	0.0001	0.001	0.001	0.05	0.01	0.001	0.0001	0.001	0.001	0.005	
ADWG 2011 Health (v3.7 updated 2022)											500 ^{#1}							11.29 ^{#2}	0.91 ^{#3}					0.01	0.002	0.001	0.0001	2	0.05	0.01	0.5	0.001	0.02			
ANZECC 2000 - Lowland Rivers (NSW coastal rivers)		6															0.01165 ^{#4}			0.04	0.35		0.008	0.025												
ANZECC 2000 - Stock Watering	5000 ^{#5}					1000					1000														0.5	0.01	1	1 ^{#8}		0.1		0.002	1	20		
ANZG (2018) - FW - 95% (updated 26 July 2021)																	0.9 ^{#9}	2.4 ^{#10}							0.013 ^{#11}	0.0002	0.001 ^{#12}	0.0014		0.0034	1.9	0.0006	0.011	0.008		
NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand																																				
>=2m, <4m																																				
>=4m, <8m																																				
>=8m																																				

Statistics

Number of Results	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	20	24	36	36	36	36	24	36	24	36	36	36
Number of Detects	24	24	0	24	24	24	24	24	24	24	24	24	24	24	24	2	22	15	11	17	24	24	6	24	23	0	1	18	12	0	24	0	25	23
Minimum Concentration	2120	17	<1	850	508	37	98	14	629	272	152	38	38.5	0.39	850	<1	<0.01	0.01	0.01	0.01	1.4	0.3	0.01	0.03	0.001	<0.0001	<0.001	0.001	<0.05	<0.001	0.005	<0.0001	0.001	0.005
Minimum Detect	2120	17	ND	850	508	37	98	14	629	272	152	38	38.5	0.39	850	11	0.02	0.01	0.01	0.01	1.4	0.3	0.01	0.03	0.001	ND	0.002	0.001	0.31	ND	0.005	ND	0.001	0.005
Maximum Concentration	14500	496	<1	1580	2920	270	564	46	3280	6170	2060	201	203	8.9	1580	89	2.66	2.77	0.32	2.77	4.8	2.9	0.22	0.29	0.011	<0.0002	0.002	0.016	4.03	<0.001	0.249	<0.0001	0.023	0.048
Maximum Detect	14500	496	ND	1580	2920	270	564	46	3280	6170	2060	201	203	8.9	1580	89	2.66	2.77	0.32	2.77	4.8	2.9	0.22	0.29	0.011	ND	0.002	0.016	4.03	ND	0.249	ND	0.023	0.048
Average Concentration *	7548	103	0.5	1200	1605	155	296	23	2035	3076	614	121	123	3.3	1196	4.6	1.5	0.9	0.056	0.95	2.8	1.8	0.038	0.12	0.0028	0.000058	0.00054	0.003	1	0.0005	0.11	0.00005	0.0047	0.011
Median Concentration *	7600	80.5	0.5	1140	1650	182	288	18.5	2065	3215	291	121.25	127.95	2.67	1140	0.5	1.915	0.21	0.005	0.22	2.45	2.15	0.005	0.11	0.002	0.00005	0.0005	0.00075	0.1675	0.0005	0.1175	0.00005	0.0015	0.007
Standard Deviation *	4124	94	0	239	898	80	174	11	993	2051	655	61	62	2.3	233	18	0.92	1.1	0.09	1.1	1	0.8	0.063	0.072	0.0028	0.000019	0.00025	0.0039	1.3	0	0.065	0	0.006	0.011
95% UCL (Student's-t) *	8991	135.7	0.5	1283	1919	183	356.6	27.31	2383	3793	842.7	142.6	145.2	4.116	1277	10.96	1.796	1.274	0.0873	1.332	3.123	2.104	0.0618	0.143	0.00364	6.37E-05	0.00061	0.00411	1.479	0.0005	0.131	0.00005	0.00641	0.014

* A Non Detect Multiplier of 0.5 has been applied.

Comments

- #1 Not specifically guideline value: >500mg/L can have purgative effects
- #2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
- #3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
- #4 Calculated from ammonia NH4
- #5 Loss of production expected at 5000 mg/L for beef cattle, 4000 mg/L dairy cattle, 10000 mg/L sheep, 6000 mg/L horses and pigs, 3000 mg/L poultry
- #6 400 mg/L divided by molecular weight, stock may tolerate higher nitrate concentrations if nitrate in feed are not high, water containing >1500 mg/L (as NO3) is likely to be toxic.
- #7 30 mg/L divided by molecular weight
- #8 >0.5 mg/L hazardous to sheep, >1 mg/L for cattle, >5 mg/L pigs and poultry
- #9 Measured as NH3-N at pH 8
- #10 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
- #11 In absence of total As guideline, As (V) guideline has been adopted.
- #12 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
- #13 Not limiting: Derived water HSL exceeds water solubility limit
- #14 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)



Appendix B

Table B4

Analytical Results for Current Monitoring Period (October 2023 to March 2024)

						BTEXN							TRH - NEPM 2013							TRH - NEPM 1999					PAHs - standard 16																
						Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	BTEX (Sum of Total) - Lab Calc	Naphthalene (BTEXN suite)	F1 (C6-C10 minus BTEX)	C6-C10 Fraction	F2 (>C10-C16 minus Naphthalene)	>C10-C16 Fraction	F3 (>C16-C34 Fraction)	F4 (>C34-C40 Fraction)	>C10-C40 (Sum of Total)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 (Sum of Total)	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b,j)fluoranthene	Benzo(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene			
						mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		
EQL						0.001	0.002	0.002	0.002	0.002	0.002	0.001	0.005	0.02	0.02	0.1	0.1	0.1	0.1	0.1	0.02	0.05	0.1	0.05	0.05	0.001	0.001	0.001	0.001	0.0005	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	
ADWG 2011 Health (v3.7 updated 2022)						0.001	0.8	0.3			0.6																0.00001														
ANZECC 2000 - Lowland Rivers (NSW coastal rivers)																																									
ANZECC 2000 - Stock Watering																																									
ANZG (2018) - FW - 95% (updated 26 July 2021)						0.95	0.18	0.08	0.35					0.016																						0.0014					
NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand																																									
>=2m, <4m						5	NL ^{#13}	NL ^{#13}				NL ^{#13}		NL ^{#13}	6 ^{#14}		NL ^{#13}																								
>=4m, <8m						5	NL ^{#13}	NL ^{#13}				NL ^{#13}		NL ^{#13}	6 ^{#14}		NL ^{#13}																								
>=8m						5	NL ^{#13}	NL ^{#13}				NL ^{#13}		NL ^{#13}	7 ^{#14}		NL ^{#13}																								

Package	Location	Date	Field ID	Sample Type	Lab Report	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.05	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M12 - West	BH104R	06/10/2023	BH104R	Normal	ES2334429	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.05	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		08/11/2023	BH104R	Normal	ES2338893-AF	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.05	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		06/12/2023	BH104R	Normal	ES2342531	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.05	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		19/01/2024	BH104R	Normal	ES2401985	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.05	<0.05	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
			GWDUP2	Interlab_D	1061811	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
		13/02/2024	BH104R	Normal	ES2404914	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.05	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	BH107R	15/03/2024	BH104R	Normal	ES2408629	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.05	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
			GWDUP2	Interlab_D	1079293	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
		06/10/2023	BH107R	Normal	ES2334429	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.05	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
			GWDUP2	Interlab_D	1033274	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
		08/11/2023	BH107R	Normal	ES2338893-AF	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.05	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
			GWDUP2	Interlab_D	1043528	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	BH107R	06/12/2023	BH107R	Normal	ES2342531	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.05	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
			GWDUP2	Interlab_D	1052387	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
		19/01/2024	BH107R	Normal	ES2401985	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.05	<0.05	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		
		13/02/2024	BH107R	Normal	ES2404914	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.05	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
			GWDUP2	Interlab_D	1069861	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	BH107R	15/03/2024	BH107R	Normal	ES2408629	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.05	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	BH112R	06/10/2023	BH112R	Normal	ES2334429	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.05	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
			GWDUP1	Field_D	ES2334429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
		08/11/2023	BH112R	Normal	ES2338893-AF	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.																				



Appendix B

Table B4

Analytical Results for Current Monitoring Period (October 2023 to March 2024)

Transport for NSW

M12 Motorway

Groundwater Monitoring Program

	BTEXN								TRH - NEPM 2013							TRH - NEPM 1999					PAHs - standard 16															
	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	BTEX (Sum of Total) - Lab Calc	Naphthalene (BTEXN suite)	F1 (C6-C10 minus BTEX)	C6-C10 Fraction	F2 (>C10-C16 minus Naphthalene)	>C10-C16 Fraction	F3 (>C16-C34 Fraction)	F4 (>C34-C40 Fraction)	>C10-C40 (Sum of Total)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 (Sum of Total)	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo[b+j]fluoranthene	Benzo(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene			
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L			
EQL	0.001	0.002	0.002	0.002	0.002	0.002	0.001	0.005	0.02	0.02	0.1	0.1	0.1	0.1	0.1	0.02	0.05	0.1	0.05	0.05	0.001	0.001	0.001	0.001	0.0005	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001		
ADWG 2011 Health (v3.7 updated 2022)	0.001	0.8	0.3			0.6																			0.00001											
ANZECC 2000 - Lowland Rivers (NSW coastal rivers)																																				
ANZECC 2000 - Stock Watering																																				
ANZG (2018) - FW - 95% (updated 26 July 2021)	0.95	0.18	0.08	0.35				0.016																0.0004		0.0002					0.0014					
NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand																																				
>=2m, <4m	5	NL ^{#13}	NL ^{#13}			NL ^{#13}		NL ^{#13}	6 ^{#14}		NL ^{#13}																									
>=4m, <8m	5	NL ^{#13}	NL ^{#13}			NL ^{#13}		NL ^{#13}	6 ^{#14}		NL ^{#13}																									
>=8m	5	NL ^{#13}	NL ^{#13}			NL ^{#13}		NL ^{#13}	7 ^{#14}		NL ^{#13}																									

Statistics																																	
Number of Results	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	4	4	4	4	4	4	4	4	4	4	4	4	
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Minimum Concentration	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.05	<0.05	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.05	<0.05	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	0.0005	0.001	0.001	0.001	0.001	0.001	0.0005	0.0025	0.01	0.01	0.05	0.05	0.05	0.05	0.05	0.01	0.025	0.05	0.025	0.025	0.0005	0.0005	0.0005	0.0005	0.00025	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
Median Concentration *	0.0005	0.001	0.001	0.001	0.001	0.001	0.0005	0.0025	0.01	0.01	0.05	0.05	0.05	0.05	0.05	0.01	0.025	0.05	0.025	0.025	0.0005	0.0005	0.0005	0.0005	0.00025	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
Standard Deviation *	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
95% UCL (Student's-t) *	0.0005	0.001	0.001	0.001	0.001	0.001	0.0005	0.0025	0.01	0.01	0.05	0.05	0.05	0.05	0.05	0.01	0.025	0.05	0.025	0.025	0.0005	0.0005	0.0005	0.0005	0.00025	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	

* A Non Detect Multiplier of 0.5 has been applied.

- Comments
- #1 Not specifically guideline value: >500mg/L can have purgative effects
- #2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
- #3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
- #4 Calculated from ammonia NH4
- #5 Loss of production expected at 5000 mg/L for beef cattle, 4000 mg/L dairy cattle, 10000 mg/L sheep, 6000 mg/L horses and pigs, 3000 mg/L poultry
- #6 400 mg/L divided by molecular weight, stock may tolerate higher nitrate concentrations if nitrate in feed are not high, water containing >1500 mg/L (as NO3) is likely to be toxic.
- #7 30 mg/L divided by molecular weight
- #8 >0.5 mg/L hazardous to sheep, >1 mg/L for cattle, >5 mg/L pigs and poultry
- #9 Measured as NH3-N at pH 8
- #10 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
- #11 In absence of total As guideline, As (V) guideline has been adopted.
- #12 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
- #13 Not limiting: Derived water HSL exceeds water solubility limit
- #14 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)

Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)



Appendix B

Table B4

Analytical Results for Current Monitoring Period (October 2023 to March 2024)

Transport for NSW

M12 Motorway

Groundwater Monitoring Program

	PAHs - standard 16					Phenols - Halogenated							Phenols - Non-Halogenated				
	Naphthalene-PAH	Phenanthrene	Pyrene	PAHs (Sum of total) - Lab calc	Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	2-Chlorophenol	2,4-Dichlorophenol	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,6-Dichlorophenol	4-Chloro-3-methylphenol	Pentachlorophenol	Phenol	2-Nitrophenol	2-Methylphenol (o-Cresol)	3,4-Methylphenol (m,p-cresol)	2,4-Dimethylphenol
EQL	0.001	0.001	0.001	0.0005	0.0005	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.001
ADWG 2011 Health (v3.7 updated 2022)				0.00001		0.3	0.2	0.02				0.01					
ANZECC 2000 - Lowland Rivers (NSW coastal rivers)																	
ANZECC 2000 - Stock Watering																	
ANZG (2018) - FW - 95% (updated 26 July 2021)	0.016	0.002				0.49	0.16	0.02				0.01	0.32				
NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand																	
>=2m, <4m	NL ^{#13}																
>=4m, <8m	NL ^{#13}																
>=8m	NL ^{#13}																

Package	Location	Date	Field ID	Sample Type	Lab Report																
M12 - West	BH104R	06/10/2023	BH104R	Normal	ES2334429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		08/11/2023	BH104R	Normal	ES2338893-AF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		06/12/2023	BH104R	Normal	ES2342531	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		19/01/2024	BH104R	Normal	ES2401985	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020	<0.0010	<0.0010
			GWDUP2	Interlab_D	1061811	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		13/02/2024	BH104R	Normal	ES2404914	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH107R	15/03/2024	BH104R	Normal	ES2408629	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP2	Interlab_D	1079293	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		06/10/2023	BH107R	Normal	ES2334429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP2	Interlab_D	1033274	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		08/11/2023	BH107R	Normal	ES2338893-AF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP2	Interlab_D	1043528	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH107R	06/12/2023	BH107R	Normal	ES2342531	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP2	Interlab_D	1052387	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		19/01/2024	BH107R	Normal	ES2401985	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010	<0.0020	<0.0010
		13/02/2024	BH107R	Normal	ES2404914	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP2	Interlab_D	1069861	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		15/03/2024	BH107R	Normal	ES2408629	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH112R	06/10/2023	BH112R	Normal	ES2334429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP1	Field_D	ES2334429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		08/11/2023	BH112R	Normal	ES2338893-AF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP1	Field_D	ES2338893-AF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		06/12/2023	BH112R	Normal	ES2342531	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		19/01/2024	BH112R	Normal	ES2401985	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010	<0.0020	<0.0010
M12 - Central	BH145R	13/02/2024	BH112R	Normal	ES2404914	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP1	Field_D	ES2404914	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		15/03/2024	BH112R	Normal	ES2408629	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		06/10/2023	BH145R	Normal	ES2334429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		09/11/2023	BH145R	Normal	ES2338893-AF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		05/12/2023	BH145R	Normal	ES2342531	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP1	Field_D	ES2342531	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		19/01/2024	BH145R	Normal	ES2401985	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010	<0.0020	<0.0010
			GWDUP1	Field_D	ES2401985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		14/02/2024	BH145R	Normal	ES2404914	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		14/03/2024	BH145R	Normal	ES2408629	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			GWDUP1	Field_D	ES2408629	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Appendix B

Table B4

Analytical Results for Current Monitoring Period (October 2023 to March 2024)

Transport for NSW

M12 Motorway

Groundwater Monitoring Program

	PAHs - standard 16					Phenols - Halogenated							Phenols - Non-Halogenated				
	Naphthalene-PAH	Phenanthrene	Pyrene	PAHs (Sum of total) - Lab calc	Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	2-Chlorophenol	2,4-Dichlorophenol	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,6-Dichlorophenol	4-Chloro-3-methylphenol	Pentachlorophenol	Phenol	2-Nitrophenol	2-Methylphenol (o-Cresol)	3,4-Methylphenol (m,p-cresol)	2,4-Dimethylphenol
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL	0.001	0.001	0.001	0.0005	0.0005	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001
ADWG 2011 Health (v3.7 updated 2022)				0.00001		0.3	0.2		0.02			0.01					
ANZECC 2000 - Lowland Rivers (NSW coastal rivers)																	
ANZECC 2000 - Stock Watering																	
ANZG (2018) - FW - 95% (updated 26 July 2021)	0.016	0.002				0.49	0.16		0.02			0.01	0.32				
NEPM 2013 Table 1A(4) HSL D Comm/Ind GW for Vapour Intrusion, Sand																	
>=2m, <4m	NL ^{#13}																
>=4m, <8m	NL ^{#13}																
>=8m	NL ^{#13}																

Statistics

Number of Results	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	<0.002	<0.001
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	<0.002	<0.001
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	0.0005	0.0005	0.0005	0.00025	0.00025	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.0005	0.0005	0.0005	0.001	0.0005
Median Concentration *	0.0005	0.0005	0.0005	0.00025	0.00025	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.0005	0.0005	0.0005	0.001	0.0005
Standard Deviation *	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95% UCL (Student's-t) *	0.0005	0.0005	0.0005	0.00025	0.00025	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.0005	0.0005	0.0005	0.001	0.0005

* A Non Detect Multiplier of 0.5 has been applied.

Comments

#1 Not specifically guideline value: >500mg/L can have purgative effects

#2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427

#3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).

#4 Calculated from ammonia NH4

#5 Loss of production expected at 5000 mg/L for beef cattle, 4000 mg/L dairy cattle, 10000 mg/L sheep, 6000 mg/L horses and pigs, 3000 mg/L poultry

#6 400 mg/L divided by molecular weight, stock may tolerate higher nitrate concentrations if nitrate in feed are not high, water containing >1500 mg/L (as NO3) is likely to be toxic.

#7 30 mg/L divided by molecular weight

#8 >0.5 mg/L hazardous to sheep, >1 mg/L for cattle, >5 mg/L pigs and poultry

#9 Measured as NH3-N at pH 8

#10 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"

#11 In absence of total As guideline, As (V) guideline has been adopted.

#12 In absence of total Cr guideline, Cr (VI) guideline has been adopted.

#13 Not limiting: Derived water HSL exceeds water solubility limit

#14 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)

Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)



Appendix B
Table B5
Baseline Groundwater Field Parameters (April 2019 to July 2022)

Well ID	Sampling Event	Date Measured	SWL (mbTOC)	LNAPL present	Temp (°C)	pH	Electrical Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Redox Potential (mV)	Corrected Redox Potential* (mV)	Comments (sheen, colour, turbidity, sediment, odour)
BH104	Event 4 - July 2019	16/07/2019	9.74	Absent	18.7	6.07	17121	1.13	114.1	319.1	Clear, slight organic sheen
BH104	Event 5 - August 2019	20/08/2019	9.895	Absent	18.9	6.64	16734	1.04	10.04	215.04	Clear, no sheen, no odour
BH104	Event 6 - September 2019	24/09/2019	9.114	Absent	19.3	6.9	16787	2.19	-33	172	Grey-brown, slightly turbid, no sheen, no odour
BH104	Event 7 - October 2019	22/10/2019	10.32	Absent	21.3	7	18174	1.32	-51.4	153.6	Grey, slightly cloudy, no sheen, no odour
BH104	Event 8 - November 2019	07/11/2019	10.25	Absent	20.8	6.22	17997	1.88	47.8	252.8	Grey-brown, turbid, no sheen, no odour
BH104	Event 9 - December 2019	12/12/2019	10.555	Absent	20.1	6.32	17318	1.13	-8.8	196.2	Light grey, slight sheen, no odour
BH104	Event 10 - January 2020	16/01/2020	10.730	Absent	20.1	5.93	17195	1.47	2.6	207.6	Black, cloudy, no sheen, no odour
BH104	Event 11 - February 2020	18/02/2020	10.62	Absent	22.6	5.88	14411	1.01	61.2	266.2	Dark, grey, cloudy, no sheen, no odour
BH104	Event 12 - March 2020	12/03/2020	10.956	Absent	22.1	6.36	8946	1.74	190.6	395.6	Clear, slight organic sheen, no odour
BH104	Event 13 - April 2020	23/04/2020	10.995	Absent	20.3	7.01	12722	1.64	70.5	275.5	Clear, slight organic sheen, no odour
BH104	Event 14 - May 2020	19/05/2020	Not recorded	Absent	-	-	-	-	-	-	No data, grab sample collected
BH104	Event 16 - July 2020	30/07/2020	12.09	Absent	18.8	6.19	11525	0.36	64.8	269.8	Clear, no sheen, no odour
BH104	Event 17 - August 2020	11/08/2020	12.08	Absent	18.4	6.2	4255	1.18	129	334	Clear, no sheen, no odour
BH104	Event 18 - September 2020	10/09/2020	12.420	Absent	20.1	5.99	43.9	3.68	-60.5	144.5	Clear, no sheen, no odour, poor recharge, DO probe malfunction during purging
BH104	Event 19 - October 2020	09/10/2020	12.370	Absent	19.4	6.55	13327	1.40	-90.1	114.9	Clear, no sheen, no odour, poor recharge
BH104	Event 20 - November 2020	13/11/2020	12.400	Absent	20.0	6.23	14403	0.32	-110.5	94.5	Clear, slight organic sheen, no odour, poor recharge
BH104	Event 21 - December 2020	08/12/2020	12.560	Absent	21.0	5.79	15155	11.25	-162.3	42.7	Clear, no sheen, no odour, poor recharge
BH104	Event 22 - January 2021	14/01/2021	12.740	Absent	20.1	6.26	14179	0.33	-139	66	Clear, no sheen, no odour, poor recharge
BH104	Event 23 - February 2021	11/02/2021	12.850	Absent	19.9	6.50	14596	0.46	-121.2	83.8	Slightly turbid grey, effluent odour, poor recharge
BH104	Event 24 - March 2021	10/03/2021	12.935	Absent	19.7	6.42	14777	0.38	-121	84	Grey, cloudy, organic odour, no sheen
BH104	Event 25 - April 2021	07/04/2021	11.470	Absent	19.8	6.81	7572	0.58	-46.3	158.7	Dark grey colour
BH104	Event 26 - May 2021	03/05/2021	12.780	Absent	18.4	6.70	12444	1.00	23.4	228.4	Clear, no sheen, no odour, poor recharge
BH104	Event 27 - June 2021	08/06/2021	11.990	Absent	18.2	6.38	12364	7.52	-54.5	150.5	Very dark, black colour, no odour, no sheen, heavy sediment load
BH104	Event 28 - July 2021	07/07/2021	12.400	Absent	18.9	6.20	13097	6.21	-24	181	Clear water with grey tinge, low sediment load, no odour, no sheen, slow purge
BH104	Event 29 - August 2021	13/08/2021	12.430	Absent	18.3	6.21	12451	0.25	45	250	Grey, black tinge, low sediment load, no sheen, no odour, poor recharge, slow flow
BH104	Event 30 - September 2021	01/09/2021	12.450	Absent	19.1	6.64	12683	0.26	-74.3	130.7	Dark grey colour, slightly turbid, no odour, no sheen, poor recharge, slow purge
BH104	Event 31 - October 2021	15/10/2021	12.750	Absent	19.0	6.24	7169	1.02	-70.7	134.3	Black, sooty water. High sediment load, No odour/sheen. Slow recharge
BH104	Event 32 - November 2021	08/11/2021	13.170	Absent	18.4	6.55	12603	0.46	-86.1	118.9	Black, dark grey. High sediment (black silt), no odour/sheen. Good recharge
BH104	Event 33 - December 2021	08/12/2021	14.230	Absent	19.2	6.58	12059	0.21	-81.8	123.2	Clear water, dark grey sediment. No odour/sheen. Slow recharge.
BH104	Event 34 - January 2022	13/01/2022	12.720	Absent	19.4	6.71	11439	12.33	-103.3	101.7	Black, turbid water. Very dark grey sediment. No odour/sheen
BH104	Event 35 - February 2022	10/02/2022	13.900	Absent	19.2	6.64	7550	0.25	-112.6	92.4	Black/dark grey, high turbidity. No odour/sheen.
BH104	Event 36 - March 2022	18/03/2022	12.270	Absent	19	6.95	7451	1.15	-132.6	72.4	Black, no odour/sheen, Good recharge
BH104	Event 38 - May 2022	25/05/2022	12.005	Absent	19.4	6.88	12842	1.97	102.70	307.7	Cloudy, no sheen, no odour, bailer sampled.
BH104	Event 39 - June 2022	27/06/2022	11.55	Absent	18.7	6.47	20281	2.78	189.00	394	Grey tinge, slightly cloudy, no sheen, no odour.
BH104	Event 40 - July 2022	20/07/2022	11.1	Absent	18.5	6.26	23501	1.44	173.60	378.6	Grey/brown, cloudy, non-transparent, no odour, no sheen
BH107	Event 4 - July 2019	18/07/2019	10.705	Absent	-	-	-	-	-	-	No data, grab sample collected
BH107	Event 5 - August 2019	20/08/2019	10.735	Absent	19.7	7.05	8853	1.35	11.7	216.7	Grey, slightly cloudy, no sheen, no odour
BH107	Event 6 - September 2019	24/09/2019	10.754	Absent	18.9	6.85	4102	1.59	88	293	Grey-brown, slightly turbid, no sheen, no odour
BH107	Event 7 - October 2019	22/10/2019	10.755	Absent	20.0	7.08	9226	1.20	23.7	228.7	Grey, slightly turbid, no sheen, no odour
BH107	Event 8 - November 2019	07/11/2019	10.725	Absent	22.7	6.85	9870	1.96	75.9	280.9	Light grey, slightly turbid, no sheen, no odour
BH107	Event 9 - December 2019	12/12/2019	10.795	Absent	21.9	6.89	9387	1.56	7.3	212.3	Light brown, cloudy, no sheen, no odour
BH107	Event 11 - February 2020	20/02/2020	10.836	Absent	22.6	6.84	9375	1.46	32.7	237.7	Grey, slightly cloudy, no sheen, no odour
BH107	Event 13 - April 2020	23/04/2020	10.845	Absent	19.4	6.77	9183	1.18	10.1	215.1	Grey, slightly turbid, no sheen, no odour
BH107	Event 14 - May 2020	21/05/2020	11.182	Absent	18.5	6.77	9247	1.91	172.7	377.7	Turbid, no sheen, no odour
BH107	Event 16 - July 2020	30/07/2020	10.69	Absent	18.8	6.23	7605	0.33	79.1	284.1	Clear, no sheen, no odour
BH107	Event 17 - August 2020	11/08/2020	10.67	Absent	18.6	6.42	9110	1.61	93.1	298.1	Grey, turbid, no sheen, no odour
BH107	Event 18 - September 2020	10/09/2020	10.72	Absent	19.2	6.66	48	2.68	-25.8	179.2	Clear, no sheen, no odour, poor recharge, DO probe malfunction during purging
BH107	Event 19 - October 2020	09/10/2020	10.69	Absent	20.0	6.78	9596	1.24	51.1	256.1	Clear, no sheen, no odour, poor recharge
BH107	Event 21 - December 2020	08/12/2020	10.71	Absent	19.6	6.57	9963	11.15	-170.2	34.8	Clear, no sheen, no odour, poor recharge
BH107	Event 22 - January 2021	14/01/2021	10.710	Absent	22.2	6.70	9349	0.67	-100.1	104.9	Clear, no sheen, no odour, poor recharge
BH107	Event 23 - February 2021	11/02/2021	10.720	Absent	21.0	6.55	9620	0.60	-24.5	180.5	Slight orange tint to clear, poor recharge
BH107	Event 24 - March 2021	10/03/2021	10.770	Absent	19.6	6.80	9607	0.65	-113.2	91.8	Grey, cloudy, organic odour, no sheen
BH107	Event 25 - April 2021	07/04/2021	10.680	Absent	19.7	6.59	6653	0.69	-46.3	158.7	-
BH107	Event 26 - May 2021	03/05/2021	10.63	Absent	20.2	6.91	6651	5.19	125.4	330.4	Light grey colour, fairly clear, no odour, no sheen, slow recharge rate
BH107	Event 27 - June 2021	08/06/2021	9.31	Absent	18.5	6.60	7320	7.62	-53.7	151.3	Very dark, black/grey colour, high sediment load, no odour or sheen



Appendix B
Table B5
Baseline Groundwater Field Parameters (April 2019 to July 2022)

Well ID	Sampling Event	Date Measured	SWL (mbTOC)	LNAPL present	Temp (°C)	pH	Electrical Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Redox Potential (mV)	Corrected Redox Potential* (mV)	Comments (sheen, colour, turbidity, sediment, odour)
BH107	Event 28 - July 2021	07/07/2021	10.600	Absent	18.8	6.30	7496	6.13	56.7	261.7	Clear water, slight grey tinge, no odour, no sheen, low sediment load, slow purge rate
BH107	Event 29 - August 2021	13/08/2021	10.570	Absent	18.7	6.88	8092	0.72	15.3	220.3	Very dark grey/black water, no odour, no sheen, low sediment load
BH107	Event 30 - September 2021	01/09/2021	10.560	Absent	19.2	6.78	8070	1.30	-18.9	186.1	Very dark grey colour, high sediment load, poor recharge, no odour, no sheen
BH107	Event 31 - October 2021	15/10/2021	10.800	Absent	19.3	6.54	4654	1.37	-87	118	Black water. High sediment load, No odour/sheen. Good recharge
BH107	Event 32 - November 2021	08/11/2021	11.070	Absent	18.4	6.69	7411	0.44	-64.3	140.7	Dark grey. High sediment. No odour/sheen. Good recharge.
BH107	Event 33 - December 2021	08/12/2021	11.060	Absent	19.2	6.70	7582	0.44	-14.2	190.8	Clear, dark grey sediment. Silty. No odour/sheen. Good recharge
BH107	Event 34 - January 2022	13/01/2022	10.090	Absent	20.0	5.98	5555	12.53	25.4	230.4	Micro-purge issues. Grab sample taken.
BH107	Event 35 - February 2022	10/02/2022	11.450	Absent	20.2	6.62	6002	0.34	39.7	244.7	Dark grey. High turbidity. No odour/sheen
BH107	Event 36 - March 2022	18/03/2022	10.160	Absent	18.3	6.98	1549	1.13	-59	146	Black, no odour/sheen, Good recharge. Water became clear after 2L
BH107	Event 38 - May 2022	25/05/2022	9.57	Absent	19.1	7.36	4245	2.12	103.30	308.3	Brown, cloudy, no sheen, no odour, bailer sampled.
BH107	Event 39 - June 2022	27/06/2022	9.655	Absent	18.7	7.2	4524	4.83	105.50	310.5	Brown, cloudy, no sheen, no odour, bailer sampled.
BH107	Event 40 - July 2022	20/07/2022	9.64	Absent	19.1	6.97	4068	3.53	86.40	291.4	Grab sample taken, one set of parameters recorded
BH112	Event 4 - July 2019	18/07/2019	17.57	Absent	-	-	-	-	-	-	No data, grab sample collected
BH112	Event 5 - August 2019	20/08/2019	17.625	Absent	19.7	6.59	10985	1.39	67.6	272.6	Brown, turbid, poor recharge
BH112	Event 6 - September 2019	25/09/2019	17.585	Absent	20.4	6.72	11553	1.79	76.7	281.7	Grey-brown, turbid, no sheen, no odour
BH112	Event 7 - October 2019	22/10/2019	17.582	Absent	19.8	6.49	11726	0.92	64.6	269.6	Brown-grey, turbid, no sheen, no odour, poor recharge
BH112	Event 8 - November 2019	07/11/2019	17.580	Absent	22.3	6.60	12865	1.12	48	253	Light brown, cloudy, no sheen, no odour
BH112	Event 9 - December 2019	12/12/2019	17.58	Absent	20.4	6.33	11883	0.97	74.4	279.4	Grey, cloudy, slight sheen
BH112	Event 11 - February 2020	20/02/2020	17.590	Absent	21.1	6.46	12693	1.42	74	279	Brown, no sheen, no odour
BH112	Event 13 - April 2020	21/04/2020	17.601	Absent	20.0	6.49	12419	1.22	169.6	374.6	Grey-brown, turbid, slight organic sheen, no odour
BH112	Event 14 - May 2020	21/05/2020	17.580	Absent	-	-	-	-	-	-	No data, too much sediment, grab sample collected
BH112	Event 16 - July 2020	30/07/2020	17.550	Absent	18.9	6.20	11966	0.49	70.2	275.2	Brown, turbid, no sheen, no odour, poor recharge
BH112	Event 17 - August 2020	13/08/2020	17.590	Absent	18.9	6.26	12274	0.76	99.3	304.3	Grey, turbid, no sheen, no odour, poor recharge
BH112	Event 18 - September 2020	10/09/2020	17.590	Absent	18.9	6.44	38.1	2.01	42.1	247.1	Clear, no sheen, no odour, poor recharge, DO probe malfunction during purging
BH112	Event 19 - October 2020	09/10/2020	17.590	Absent	19.9	6.46	12521	1.45	85.9	290.9	Low sediment load, no sheen, no odour, poor recharge
BH112	Event 21 - December 2020	08/12/2020	17.580	Absent	19.7	6.25	12848	10.74	67.5	272.5	Clear, no sheen, no odour, poor recharge
BH112	Event 22 - January 2021	14/01/2021	17.580	Absent	22.1	6.54	12760	0.49	36.2	241.2	Slightly turbid brown, no sheen, no odour, poor recharge
BH112	Event 23 - February 2021	11/02/2021	17.800	Absent	21.7	6.52	13061	1.08	60.4	265.4	Turbid brown, no sheen, no odour, poor recharge
BH112	Event 24 - March 2021	10/03/2021	17.590	Absent	19.6	6.66	12724	0.54	17.1	222.1	Grey, some sediment, no sheen, no odour
BH112	Event 25 - April 2021	07/04/2021	17.050	Absent	19.9	6.77	4873	0.22	111.8	316.8	light grey tinge
BH112	Event 26 - May 2021	03/05/2021	17.390	Absent	18.0	6.58	8682	1.69	36.7	241.7	brown murky tinge, no odour, no sheen, low sediment load
BH112	Event 27 - June 2021	08/06/2021	17.500	Absent	18.8	6.57	7550	7.58	-17.6	187.4	light grey colour, no odour, no sheen, high sediment load, slow recharge, slow flow
BH112	Event 28 - July 2021	07/07/2021	17.560	Absent	19.3	7.10	8444	5.45	-2.5	202.5	very turbid, brown murky water, no odour, no sheen, slow purge rate, good recharge
BH112	Event 29 - August 2021	13/08/2021	17.590	Absent	18.7	6.52	8007	0.32	444	649	Dark grey/black colour, no odour, no sheen, low sediment load
BH112	Event 30 - September 2021	01/09/2021	17.600	Absent	19.4	6.67	9130	0.72	21	226	Very turbid, brown water, high sediment load, no odour, no sheen, poor recharge
BH112	Event 31 - October 2021	15/10/2021	17.590	Absent	19.3	6.67	9145	0.50	24	229	Very turbid brown/black water. High sediment load. No odour/sheen. Poor recharge
BH112	Event 32 - November 2021	08/11/2021	18.290	Absent	18.4	6.56	9513	0.57	-20.7	184.3	Silty brown colour, High sediment, No odour/sheen
BH112	Event 33 - December 2021	08/12/2021	18.650	Absent	19.4	6.31	9961	1.50	20.7	225.7	Dark sediment. Very silty. No odour/sheen. Poor recharge
BH112	Event 34 - January 2022	13/01/2022	19.090	Absent	19.8	6.55	9987	12.32	6.7	211.7	Light grey. No odour/sheen. Poor recharge
BH112	Event 35 - February 2022	10/02/2022	18.540	Absent	20.6	6.48	10728	1.78	72	277	Light brown. Moderate turbidity. No odour/sheen
BH112	Event 36 - March 2022	18/03/2022	16.090	Absent	18.6	7.00	4150	1.05	31	236	Grey, no odour/sheen, water became clear after 2.5L
BH112	Event 38 - May 2022	25/05/2022	15.235	Absent	19.8	7.1	3233	1.91	98.10	303.1	Brown, cloudy, some seditemnt, no sheen, no odour, bailer sampled
BH112	Event 39 - June 2022	27/06/2022	15.005	Absent	18.7	7.01	3190	5.88	104.30	309.3	Brown, cloudy, no sheen, no odour, bailer sampled.
BH112	Event 40 - July 2022	20/07/2022	13.97	Absent	19.4	6.89	3921	4.30	94.90	299.9	Grab sample taken, one set of parameters recorded. Pale yellow, no odour, no sheen
BH145	Event 3 - June 2019	13/06/2019	16.350	Absent	17.2	6.7	7307	1.23	165	370	Grey-brown, cloudy, no sheen, no odour, poor recharge
BH145	Event 4 - July 2019	17/07/2019	18.250	Absent	-	-	-	-	-	-	No data, grab sample collected
BH145	Event 5 - August 2019	21/08/2019	18.270	Absent	-	-	-	-	-	-	No data, grab sample collected
BH145	Event 6 - September 2019	26/09/2019	18.317	Absent	-	-	-	-	-	-	No data, grab sample collected
BH145	Event 7 - October 2019	23/10/2019	Not recorded	Absent	20.6	7.09	5334.4	2.94	129.5	334.5	Not recorded
BH145	Event 8 - November 2019	08/11/2019	18.587	Absent	-	-	-	-	-	-	Bailer lost, no sample or data collected
BH145	Event 9 - December 2019	12/12/2019	18.715	Absent	-	-	-	-	-	-	No data, grab sample collected
BH145	Event 14 - May 2020	21/05/2020	16.54	Absent	17.5	6.28	5045	1.15	203.4	408.4	Slightly turbid, no sheen, no odour
BH145	Event 16 - July 2020	30/07/2020	13.93	Absent	16.5	5.57	3145	0.26	179.1	384.1	Brown, turbid, no sheen, no odour, poor recharge



Appendix B
Table B5
Baseline Groundwater Field Parameters (April 2019 to July 2022)

Well ID	Sampling Event	Date Measured	SWL (mbTOC)	LNAPL present	Temp (°C)	pH	Electrical Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Redox Potential (mV)	Corrected Redox Potential* (mV)	Comments (sheen, colour, turbidity, sediment, odour)
BH145	Event 17 - August 2020	13/08/2020	16.42	Absent	17.1	6.03	4669	1.26	65.7	270.7	Clear, no sheen, no odour, poor and insufficient recharge - grab sample taken
BH145	Event 18 - September 2020	09/09/2020	17.7	Absent	18.8	6.29	3802	0.11	-46.3	158.7	Brown, turbid, no sheen, no odour, poor recharge, DO probe malfunction
BH145	Event 19 - October 2020	08/10/2020	18.96	Absent	19.8	6.46	7948	1.38	80.9	285.9	Brown, turbid, high sediment load, no sheen, no odour, poor recharge
BH145	Event 20 - November 2020	11/11/2020	14.51	Absent	18.9	6.09	2913	0.33	-19.2	185.8	Brown, turbid, no sheen, no odour, poor recharge
BH145	Event 21 - December 2020	09/12/2020	16.625	Absent	19.8	6.16	3612	0.59	-50.7	154.3	Turbid brown, no sheen, no odour, poor recharge
BH145	Event 22 - January 2021	12/01/2021	18.015	Absent	-	-	-	-	-	-	No data, grab sample collected
BH145	Event 23 - February 2021	09/02/2021	18.21	Absent	-	-	-	-	-	-	No data, grab sample collected
BH145	Event 24 - March 2021	10/03/2021	18.43	Absent	20.1	6.6	6075	0.81	59.3	264.3	Brown, cloudy, some sediment, no sheen, no odour
BH145	Event 25 - April 2021	07/04/2021	17.595	Absent	18.6	6.23	3740	0.69	3.7	208.7	Dark brown, turbid
BH145	Event 26 - May 2021	03/05/2021	19.85	Absent	-	-	-	-	-	-	Unable to purge, well was dry, no water coming up due to low SWL
BH145	Event 27 - June 2021	08/06/2021	19.49	Absent	-	-	-	-	-	-	Bailer used for grab sample, less than 1m of water available, very muddy. No data recorded. Half set of samples.
BH145	Event 28 - July 2021	07/07/2021	19.41	Absent	-	-	-	-	-	-	Bailer used for grab sample, less than 1m of water available. No data recorded
BH145	Event 29 - August 2021	13/08/2021	-	-	-	-	-	-	-	-	not sampled
BH145	Event 30 - September 2021	01/09/2021	19.17	Absent	-	-	-	-	-	-	not enough water to purge, took grab sample.
BH145	Event 31 - October 2021	15/10/2021	19.47	Absent	-	-	-	-	-	-	Bailer used for grab sample. No data recorded
BH145	Event 32 - November 2021	08/11/2021	19.32	Absent	-	-	-	-	-	-	Bailer used for grab sample. No data recorded
BH145	Event 33 - December 2021	08/12/2021	19.19	Absent	-	-	-	-	-	-	Bailer used for grab sample. No data recorded
BH145	Event 34 - January 2022	13/01/2022	19.1	Absent	-	-	-	-	-	-	Bailer used for grab sample. No data recorded
BH145	Event 35 - February 2022	10/02/2022	19.17	Absent	-	-	-	-	-	-	Bailer used for grab sample. No data recorded
BH145	Event 36 - March 2022	18/03/2022	18.63	Absent	-	-	-	-	-	-	Bailer used for grab sample. No data recorded
BH145	Event 38 - May 2022	25/05/2022	18.655	Absent	15.8	6.03	4587	0.62	125.60	330.6	Cloudy, no sheen, no odour, bailer sampled.
BH145	Event 39 - June 2022	27/06/2022	19.065	Absent	-	-	-	-	-	-	No data, grab sample collected
BH145	Event 40 - July 2022	20/07/2022	18.402	Absent	15.4	6.1	2978	4.90	101.80	306.8	Grab sample taken, one set of parameters recorded. Pale yellow, no odour, no sheen

*Corrected for standard hydrogen electrode (SHE) by adding 205 mV to YSI redox potential reading



Appendix B
Table B6
Construction Monitoring Period Groundwater Field Parameters (August 2022 to March 2024)

Well ID	Sampling Event	Date Measured	SWL (mbTOC)	LNAPL present	Temp (°C)	pH	Electrical Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Redox Potential (mV)	Corrected Redox Potential* (mV)	Comments (sheen, colour, turbidity, sediment, odour)
BH104	Event 41 - August 2022	15/08/2022	10.800	Absent	18.6	6.11	21707	3.00	176.10	381.1	Slightly grey, slightly turbid, no odour/sheen
BH104	Event 42 - September 2022	19/09/2022	10.770	Absent	19.5	6.8	21616	1.20	148.00	353	Clear, no odour/sheen
BH104	Event 43 - October 2022	20/10/2022	10.480	Absent	18.9	6.5	20836	0.80	165.70	370.7	Clear, no sediment, no odour/sheen. Slight pale yellow tinge, no sediment, clear, no odour/sheen.
BH104	Event 44 - November 2022	16/11/2022	10.140	Absent	18.3	6.6	32098	0.52	152.10	357.1	Clear, no odour/sheen.
BH104R	Event 45 - December 2022	16/12/2022	8.310	Absent	18.6	6.98	6344	0.82	-73.70	131.3	Grey-brown, very cloudy, no sediment, no odour/sheen.
BH104R	Event 46 - January 2023	18/01/2023	8.618	Absent	19.40	6.74	5687	0.09	-74.90	130.1	Clear, no sediment, no odour/sheen.
BH104R	Event 47 - February 2023	08/02/2023	8.795	Absent	19.3	6.76	7700	0.75	-80.20	124.8	Grey, cloudy, no odour or sheen.
BH104R	Event 48 - March 2023	03/03/2023	9.300	Absent	19.5	6.79	6017	0.74	-30.10	174.9	Grey, cloudy, no odour or sheen.
BH104R	Event 49 - April 2023	04/04/2023	9.367	Absent	19.5	6.89	5049	0.13	19.50	224.5	Yellow tinge, cloudy, no odour/sheen.
BH104R	Event 50 - May 2023	02/05/2023	9.440	Absent	18.8	6.52	8072	3.10	-7.00	198	Mostly clear, no sediment, slight organic odour, no sheen. Good recharge.
BH104R	Event 51 - June 2023	07/06/2023	9.850	Absent	20.1	6.84	9508	5.20	32.20	237.2	Clear, no odour, no sediment, no sheen.
BH104R	Event 52 - July 2023	05/07/2023	10.330	Absent	18.9	6.80	8110	0.11	38.40	243.4	Clear, no odour, no sheen, no sediment.
BH104R	Event 53 - August 2023	09/08/2023	11.570	Absent	18.3	7.15	8154	9.39	10.40	215.4	Mostly clear, no sediment, no odour, no sheen. Good recharge.
BH104R	Event 54 - September 2023	05/09/2023	11.563	Absent	19.1	6.81	8350	2.81	-28.80	176.2	Light brown tinge, mostly clear, no odour or sheen.
BH104R	Event 55 - October 2023	06/10/2023	11.790	Absent	19.4	6.66	7707	0.00	-33.50	171.5	Clear, no odour or sheen.
BH104R	Event 56 - November 2023	08/11/2023	11.620	Absent	19.6	6.68	9152	0.12	7.00	212	Mostly clear, pale yellow tinge, no odour, no sheen, sediment.
BH104R	Event 57 - December 2023	06/12/2023	11.465	Absent	21.1	6.78	8611	0.08	-97.90	107.1	Clear, no odour, no sheen, no sediment. Great recharge.
BH104R	Event 58 - January 2024	19/01/2024	11.135	Absent	20.2	6.96	7518	0.03	-72.80	132.2	Clear, slight sulphide odour, no sheen, no sediment
BH104R	Event 59 - February 2024	13/02/2024	11.075	Absent	21.8	6.68	8312	0.25	-112.90	92.10	White, slightly cloudy, no odour, no sheen, no sediment
BH104R	Event 60 - March 2024	15/03/2024	11.050	Absent	19.5	6.56	7763	0.00	-102.40	102.60	Clear, no odour, no sheen, no sediment.
BH107	Event 41 - August 2022	15/08/2022	9.530	Absent	19.3	6.89	4428	4.40	106.40	311.4	Bailer used for grab sample. Clear, no odour/sheen
BH107	Event 42 - September 2022	19/09/2022	10.010	Absent	23.2	7.6	4643	4.59	76.10	281.1	pale yellow, no sediment, no odour/sheen
BH107	Event 43 - October 2022	20/10/2022	9.775	Absent	18.8	6.9	4780	0.94	96.00	301	Pale brown, cloudy, no odour/sheen. Clear, no odour/sheen
BH107	Event 44 - November 2022	16/11/2022	9.515	Absent	18.7	7.4	6707	0.98	45.30	250.3	Pale grey tinge, turbid, no sediment, no odour/sheen.
BH107R	Event 45 - December 2022	16/12/2022	6.870	Absent	18.1	7.37	2651	3.15	70.60	275.6	Brown, no sediment, no odour/sheen
BH107R	Event 46 - January 2023	18/01/2023	-	Absent	-	-	-	-	-	-	No access to sampling location for this round.
BH107R	Event 47 - February 2023	08/02/2023	7.025	Absent	19.3	7.19	3021	0.12	31.10	236.1	Clear, no odour/sheen.
BH107R	Event 48 - March 2023	03/03/2023	7.060	Absent	19.4	7.18	2824	0.12	37.80	242.8	Grey, cloudy, no odour or sheen.
BH107R	Event 49 - April 2023	04/04/2023	7.110	Absent	19.4	7.66	2542	0.24	36.90	241.9	Clear, no odour/sheen.
BH107R	Event 50 - May 2023	02/05/2023	7.150	Absent	18.8	6.83	3023	7.73	115.30	320.3	Clear, no sediment, no odour, no sheen.
BH107R	Event 51 - June 2023	07/06/2023	-	-	-	-	-	-	-	-	CPB determined no safe access across alignment from, southern side to northern side where BH107R is located.
BH107R	Event 52 - July 2023	05/07/2023	7.450	Absent	18.1	7.20	2568	1.42	440.10	645.1	Clear, no odour, no sheen, no sediment, poor recharge.
BH107R	Event 53 - August 2023	09/08/2023	7.620	Absent	18.7	7.41	3107	9.65	71.80	276.8	Clear, no odour, no sheen, no sediment.
BH107R	Event 54 - September 2023	05/09/2023	7.579	Absent	18.4	7.15	3144	4.96	60.60	265.6	Pale brown tinge, slightly turbid, no odour or sheen.
BH107R	Event 55 - October 2023	06/10/2023	7.698	Absent	18.9	7.31	3110	9.91	108.30	313.3	Pale brown tinge, slightly turbid, no odour or sheen.
BH107R	Event 56 - November 2023	08/11/2023	7.800	Absent	19.5	7.11	3438	3.63	101.90	306.9	Mostly clear, pale yellow tinge, no odour, no sheen, no sediment.
BH107R	Event 57 - December 2023	06/12/2023	7.810	Absent	20.6	7.06	3457	2.76	87.50	292.5	Clear, no odour, no sheen, no sediment, poor to no recharge.
BH107R	Event 58 - January 2024	19/01/2024	7.760	Absent	20.1	7.2	3373	0.32	81.40	286.4	Pale brown tinge, slightly cloudy, no odour or sheen. Poor recharge.
BH107R	Event 59 - February 2024	13/02/2024	7.730	Absent	21.6	6.97	3542	0.63	53.50	258.50	Clear, no odour, no sheen, no sediment
BH107R	Event 60 - March 2024	15/03/2024	7.795	Absent	19.6	6.87	3193	1.87	43.80	248.80	Pale brown, cloudy, no odour or sheen. Poor recharge.
BH112	Event 41 - August 2022	15/08/2022	13.560	Absent	19.1	6.72	3226	4.34	109.80	314.8	Bailer used for grab sample. Slight grey tinge, no sediment, no odour/sheen
BH112	Event 42 - September 2022	19/09/2022	13.460	Absent	24.2	7.4	3629	4.56	68.60	273.6	Pale yellow, very cloudy, no sediment, no odour/sheen
BH112	Event 43 - October 2022	20/10/2022	13.300	Absent	18.6	7.0	3117	2.63	151.10	356.1	Dark brown, very cloudy, non-transparent, no odour/sheen. Able to purge groundwater as CPB haul road established
BH112	Event 44 - November 2022	16/11/2022	14.180	Absent	18.9	7.2	4722	1.17	81.80	286.8	Pale brown, very turbid, some sediment load, no odour/sheen. Pale brown tinge, mostly clear, no odour/sheen.
BH112R	Event 45 - December 2022	16/12/2022	-	-	-	-	-	-	-	-	No access to sampling location for this round.
BH112R	Event 46 - January 2023	18/01/2023	-	-	-	-	-	-	-	-	No access to sampling location for this round.
BH112R	Event 47 - February 2023	08/02/2023	-	-	-	-	-	-	-	-	No access to sampling location for this round.
BH112R	Event 48 - March 2023	03/03/2023	-	-	-	-	-	-	-	-	No access to sampling location for this round.
BH112R	Event 49 - April 2023	04/04/2023	-	-	-	-	-	-	-	-	No access to sampling location for this round.
BH112R	Event 50 - May 2023	02/05/2023	-	-	-	-	-	-	-	-	No access to sampling location for this round.
BH112R	Event 51 - June 2023	07/06/2023	Dry	Absent	-	-	-	-	-	-	Replacement well of replacement well BH112R. Well measured as Dry.
BH112R	Event 52 - July 2023	05/07/2023	12.000	Absent	-	-	-	-	-	-	Well not developed at this stage. Presence of water alerted to CPB and well to be developed.
BH112R	Event 53 - August 2023	09/08/2023	12.425	Absent	19.7	6.88	14408	8.38	113.00	318	Mostly clear, no odour, no sheen, no sediment. Poor recharge
BH112R	Event 54 - September 2023	05/09/2023	12.407	Absent	19.9	6.71	14971	0.31	55.10	260.1	Light brown, moderate turbidity, moderate sediment, no odour, no sheen
BH112R	Event 55 - October 2023	06/10/2023	12.700	Absent	18.8	6.89	13124	6.89	119.90	324.9	Pale brown tinge, slightly turbid, no odour or sheen.



Appendix B
Table B6
Construction Monitoring Period Groundwater Field Parameters (August 2022 to March 2024)

Well ID	Sampling Event	Date Measured	SWL (mbTOC)	LNAPL present	Temp (°C)	pH	Electrical Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Redox Potential (mV)	Corrected Redox Potential* (mV)	Comments (sheen, colour, turbidity, sediment, odour)
BH112R	Event 56 - November 2023	08/11/2023	12.905	Absent	19.4	6.66	15954	0.08	58.30	263.3	Mostly clear, slightly cloudy, no odour, no sheen, no sediment.
BH112R	Event 57 - December 2023	06/12/2023	13.020	Absent	21.9	6.66	16111	0.24	69.50	274.5	Clear, no odour, no sheen, no sediment.
BH112R	Event 58 - January 2024	19/01/2024	13.045	Absent	21.1	6.79	14444	0.26	100.30	305.3	Clear, no odour, no sheen, no sediment.
BH112R	Event 59 - February 2024	13/02/2024	13.095	Absent	21.2	6.55	13913	0.42	74.10	279.10	Mostly clear, no odour, no sheen, no sediment
BH112R	Event 60 - March 2024	15/03/2024	13.141	Absent	22.1	6.37	15400	0.96	104.40	309.40	Clear, no odour, no sheen, no sediment. Good recharge.
BH144	Event 44 - November 2022	15/11/2022	16.560	Absent	20.2	6.2	2360	0.42	83.80	288.8	Pale brown, very turbid, no sediment, no odour/sheen.
BH145	Event 41 - August 2022	15/08/2022	18.660	Absent	-	-	-	-	-	-	Bailer used for grab sample. No data recorded. Brown, turbid, no odour/sheen
BH145	Event 42 - September 2022	20/09/2022	18.905	Absent	-	-	-	-	-	-	Bailer used due to low SWL. No parameters recorded due to preference of samples
BH145	Event 43 - October 2022	19/10/2022	18.470	Absent	19.1	6.2	4165	3.29	158.70	363.7	Low water level, one set parameters taken and samples collected.
BH145	Event 44 - November 2022	15/11/2022	18.615	Absent	20.9	6.3	6486	2.07	151.30	356.3	One set parameters recorded and grab sample due to low. amount of water available
BH145	Event 45 - December 2022	14/12/2022	18.980	Absent	-	-	-	-	-	-	No parameters recorded due to low standing water level. All samples collected.
BH145	Event 46 - January 2023	17/01/2023	19.200	Absent	-	-	-	-	-	-	Brown, turbid, no odour/sheen. No parameters recorded due to low amount of water available.
BH145	Event 47 - February 2023	07/02/2023	19.225	Absent	-	-	-	-	-	-	Brown, turbid, no odour/sheen. No parameters recorded due to low. water available.
BH145	Event 48 - March 2023	02/03/2023	19.300	Absent	-	-	-	-	-	-	Dark brown/grey, cloudy, high sediment, no odour/sheen. Low water level, grab samples taken, no parameters recorded due to lack of water available.
BH145R	Event 49 - April 2023	05/04/2023	11.920	Absent	18.6	7.54	3815	0.17	-152.60	52.4	Clear, no odour/sheen.
BH145R	Event 50 - May 2023	02/05/2023	12.030	Absent	18.9	6.61	10273	0.50	-120.00	85	Pale grey tinge, mostly clear, slight unidentified odour.
BH145R	Event 51 - June 2023	06/06/2023	11.980	Absent	18.3	6.93	12863	0.16	-143.00	62	Mostly clear, organic odour, no sediment, no sheen.
BH145R	Event 52 - July 2023	05/07/2023	11.810	Absent	18.5	6.40	12419	0.12	-83.90	121.1	Light grey tinge, mostly clear.
BH145R	Event 53 - August 2023	09/08/2023	11.906	Absent	19.1	6.78	13966	2.27	-79.70	125.3	Grab sample, one set of parameters collected as geocontrol, pump is faulty.
BH145R	Event 54 - September 2023	06/09/2023	11.777	Absent	18.3	6.71	14262	0.40	-72.20	132.8	Sightly brown, low turbidity, low sediment, no odour or sheen, great recharge
BH145R	Event 55 - October 2023	06/10/2023	11.760	Absent	19.3	6.65	14187	0.10	-92.80	112.2	Clear, no odour or sheen.
BH145R	Event 56 - November 2023	09/11/2023	11.650	Absent	19.7	6.58	18021	0.02	-84.00	121	Clear, no odour, no sheen, no sediment. Good recharge.
BH145R	Event 57 - December 2023	05/12/2023	11.525	Absent	19.6	6.6	16963	0.03	-93.80	111.2	Clear, slight sulfuric odour, no sheen, great recharge.
BH145R	Event 58 - January 2024	18/01/2024	11.260	Absent	19.8	6.75	16065	0.01	-80.70	124.3	Clear, no sediment, no odour or sheen, good recharge.
BH145R	Event 59 - February 2024	14/02/2024	11.300	Absent	20.4	6.51	17357	0.39	-85.10	119.90	Clear, no odour or sheen, no sediment, low turbidity
BH145R	Event 60 - March 2024	14/03/2024	11.270	Absent	19.7	6.29	17323	0.00	-107.80	97.20	Pale grey tinge, most clear, slight sulfuric odour, no sheen.

*Corrected for standard hydrogen electrode (SHE) by adding 205 mV to YSI redox potential reading



Appendix B
Table B7
Current Monitoring Period Groundwater Field Parameters (October 2023 to March 2024)

Well ID	Sampling Event	Date Measured	SWL (mbTOC)	LNAPL present	Temp (°C)	pH	Electrical Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Redox Potential (mV)	Corrected Redox Potential* (mV)	Comments (sheen, colour, turbidity, sediment, odour)
BH104R	Event 55 - October 2023	06/10/2023	11.790	Absent	19.4	6.66	7707	0.00	-33.50	171.5	Clear, no odour or sheen.
BH104R	Event 56 - November 2023	08/11/2023	11.620	Absent	19.6	6.68	9152	0.12	7.00	212	Mostly clear, pale yellow tinge, no odour, no sheen, sediment.
BH104R	Event 57 - December 2023	06/12/2023	11.465	Absent	21.1	6.78	8611	0.08	-97.90	107.1	Clear, no odour, no sheen, no sediment. Great recharge.
BH104R	Event 58 - January 2024	19/01/2024	11.135	Absent	20.2	6.96	7518	0.03	-72.80	132.2	Clear, slight sulphide odour, no sheen, no sediment
BH104R	Event 59 - February 2024	13/02/2024	11.075	Absent	21.8	6.68	8312	0.25	-112.90	92.10	White, slightly cloudy, no odour, no sheen, no sediment
BH104R	Event 60 - March 2024	15/03/2024	11.050	Absent	19.5	6.56	7763	0.00	-102.40	102.60	Clear, no odour, no sheen, no sediment.
BH107R	Event 55 - October 2023	06/10/2023	7.698	Absent	18.9	7.31	3110	9.91	108.30	313.3	Pale brown tinge, slightly turbid, no odour or sheen.
BH107R	Event 56 - November 2023	08/11/2023	7.800	Absent	19.5	7.11	3438	3.63	101.90	306.9	Mostly clear, pale yellow tinge, no odour, no sheen, no sediment.
BH107R	Event 57 - December 2023	06/12/2023	7.810	Absent	20.6	7.06	3457	2.76	87.50	292.5	Clear, no odour, no sheen, no sediment, poor to no recharge.
BH107R	Event 58 - January 2024	19/01/2024	7.760	Absent	20.1	7.2	3373	0.32	81.40	286.4	Pale brown tinge, slightly cloudy, no odour or sheen. Poor recharge.
BH107R	Event 59 - February 2024	13/02/2024	7.730	Absent	21.6	6.97	3542	0.63	53.50	258.50	Clear, no odour, no sheen, no sediment
BH107R	Event 60 - March 2024	15/03/2024	7.795	Absent	19.6	6.87	3193	1.87	43.80	248.80	Pale brown, cloudy, no odour or sheen. Poor recharge.
BH112R	Event 55 - October 2023	06/10/2023	12.700	Absent	18.8	6.89	13124	6.89	119.90	324.9	Pale brown tinge, slightly turbid, no odour or sheen.
BH112R	Event 56 - November 2023	08/11/2023	12.905	Absent	19.4	6.66	15954	0.08	58.30	263.3	Mostly clear, slightly cloudy, no odour, no sheen, no sediment.
BH112R	Event 57 - December 2023	06/12/2023	13.020	Absent	21.9	6.66	16111	0.24	69.50	274.5	Clear, no odour, no sheen, no sediment.
BH112R	Event 58 - January 2024	19/01/2024	13.045	Absent	21.1	6.79	14444	0.26	100.30	305.3	Clear, no odour, no sheen, no sediment.
BH112R	Event 59 - February 2024	13/02/2024	13.095	Absent	21.2	6.55	13913	0.42	74.10	279.10	Mostly clear, no odour, no sheen, no sediment
BH112R	Event 60 - March 2024	15/03/2024	13.141	Absent	22.1	6.37	15400	0.96	104.40	309.40	Clear, no odour, no sheen, no sediment. Good recharge.
BH145R	Event 55 - October 2023	06/10/2023	11.760	Absent	19.3	6.65	14187	0.10	-92.80	112.2	Clear, no odour or sheen.
BH145R	Event 56 - November 2023	09/11/2023	11.650	Absent	19.7	6.58	18021	0.02	-84.00	121	Clear, no odour, no sheen, no sediment. Good recharge.
BH145R	Event 57 - December 2023	05/12/2023	11.525	Absent	19.6	6.6	16963	0.03	-93.80	111.2	Clear, slight sulfuric odour, no sheen, great recharge.
BH145R	Event 58 - January 2024	18/01/2024	11.260	Absent	19.8	6.75	16065	0.01	-80.70	124.3	Clear, no sediment, no odour or sheen, good recharge.
BH145R	Event 59 - February 2024	14/02/2024	11.300	Absent	20.4	6.51	17357	0.39	-85.10	119.90	Clear, no odour or sheen, no sediment, low turbidity
BH145R	Event 60 - March 2024	14/03/2024	11.270	Absent	19.7	6.29	17323	0.00	-107.80	97.20	Pale grey tinge, most clear, slight sulfuric odour, no sheen.

*Corrected for standard hydrogen electrode (SHE) by adding 205 mV to YSI redox potential reading



Appendix B
Table B8
Heavy Metal Concentrations
and Hardness-Modified Trigger Values (HMTV)

Transport for NSW
M12 Motorway
Groundwater Monitoring Program

Well ID	Phase	Date	Hardness mg/L	Cadmium µg/L		Chromium µg/L		Copper µg/L		Lead µg/L		Nickel µg/L		Zinc µg/L	
ANZECC (2000) Freshwater Trigger Value				0.2	HMTV	1.0	HMTV	1.4	HMTV	3.4	HMTV	11	HMTV	8	HMTV
BH104 / BH104R	Baseline	10/09/2020	1,550	<0.1	6.7	<1	25.4	2	40.0	<1	510	22	315	61	229
		9/10/2020	1,610	<0.1	6.9	<1	26.2	1	41.3	<1	535	31	325	25	236
		13/11/2020	2,020	<0.1	8.5	<1	31.6	<1	50.1	<1	713	137	394	25	286
		8/12/2020	2,090	<0.1	8.7	2	32.5	<1	51.6	<1	745	105	405	93	295
		14/01/2021	1,900	<0.1	8.0	<1	30.0	<1	47.6	<1	660	175	374	19	272
		11/02/2021	2,110	<0.1	8.8	<1	32.7	<1	52.0	<1	754	81	409	<5	297
		10/03/2021	2,190	<0.1	9.1	<1	33.7	2	53.7	<1	790	57	422	25	307
		7/04/2021	833	<0.1	3.9	<1	15.3	2	23.6	<1	232	40	186	8	135
		4/05/2021	1,490	<0.1	6.5	<1	24.6	2	38.7	<1	485	108	304	30	221
		8/06/2021	1,860	<0.1	7.9	<1	29.5	2	46.7	<1	642	81	367	62	267
		7/07/2021	1,860	<0.1	7.9	<1	29.5	<1	46.7	<1	642	11	367	7	267
		13/08/2021	1,910	<0.1	8.1	<1	30.1	<1	47.8	<1	664	57	376	92	273
		1/09/2021	1,590	<0.1	6.8	<1	25.9	<1	40.9	<1	526	33	321	7	234
		15/10/2021	1,860	<0.1	7.9	2	29.5	2	46.7	<1	642	43	367	39	267
		8/11/2021	1,680	<0.1	7.2	<1	27.1	2	42.9	<1	565	35	337	19	245
		8/12/2021	1,400	<0.1	6.1	<1	23.4	4	36.7	<1	448	23	288	149	210
		13/01/2022	1,470	<0.1	6.4	<1	24.3	9	38.3	<1	476	35	301	11	219
		10/02/2022	637	<0.1	3.0	<1	12.3	<1	18.8	<1	165	60	148	<5	107
		18/03/2022	645	<0.1	3.1	<1	12.4	8	19.0	<1	167	192	149	8	109
		25/05/2022	2,540	<0.1	10.4	<1	38.1	34	60.9	<1	954	3	479	8	348
		27/06/2022	3,730	<0.1	14.6	<1	52.2	71	84.4	<1	1555	24	663	8	482
		20/07/2022	3,540	0.3	14.0	2	50.0	89	80.8	<1	1455	11	635	11	462
	Construction	15/08/2022	3980	<0.1	15.5	<1	55.0	81	89.2	<1	1688	8	701	6	510
		19/09/2022	4140	<0.1	16.1	<1	56.8	87	92.3	<1	1775	71	725	16	527
		20/10/2022	4020	<0.1	15.6	<1	55.5	28	90.0	<1	1710	10	707	11	514
		16/11/2022	4320	<0.1	16.7	<1	58.9	36	95.7	<1	1873	8	752	7	547
		16/12/2022	823	<0.1	3.8	<1	15.1	<1	23.4	<1	228	1	184	6	134
		18/01/2023	1180	<0.1	5.3	<1	20.3	<1	31.7	<1	360	1	249	<5	181
		8/02/2023	1060	<0.1	4.8	<1	18.6	<1	29.0	<1	315	<1	228	<5	166
		3/03/2023	1300	<0.1	5.7	<1	22.0	<1	34.5	<1	408	1	271	67	197
		4/04/2023	1380	<0.1	6.0	<1	23.1	<1	36.3	<1	440	14	285	8	207
		2/05/2023	1180	<0.1	5.3	<1	20.3	<1	31.7	<1	360	4	249	36	181
		7/06/2023	1520	<0.1	6.6	<1	25.0	2	39.4	<1	497	3	309	7	225
		7/07/2023	1360	<0.1	6.0	<1	22.8	<1	35.8	<1	432	3	281	<5	205
		9/08/2023	1570	<0.1	6.8	<1	25.7	<1	40.5	<1	518	2	318	12	231
		5/09/2023	1190	<0.1	5.3	<1	20.5	<1	32.0	<1	364	1	251	5	183
		6/10/2023	1370	<0.1	6.0	<1	23.0	<1	36.0	<1	436	23	283	23	206
		8/11/2023	1100	<0.1	4.9	<1	19.2	2	29.9	<1	330	1	235	6	171
		6/12/2023	888	<0.1	4.1	<1	16.1	<1	24.9	<1	251	<1	196	6	142
		19/01/2024	936	<0.1	4.3	<1	16.8	<1	26.1	<1	269	<1	205	<5	149
		13/02/2024	882	<0.1	4.1	<1	16.0	<1	24.8	<1	249	1	195	<5	142
		15/03/2024	920	<0.1	4.2	<1	16.6	<1	25.7	<1	263	<1	202	<5	147
BH107 / BH107R	Baseline	10/09/2020	1,650	<0.1	7.1	<1	26.7	84	42.2	2	552	23	332	85	241
		9/10/2020	1,530	0.1	6.6	<1	25.1	74	39.6	3	501	55	311	122	226
		8/12/2020	1,600	<0.1	6.9	<1	26.1	<1	41.1	<1	531	109	323	34	235
		14/01/2021	1,500	<0.1	6.5	<1	24.7	1	38.9	<1	489	68	306	17	222
		11/02/2021	1,650	0.6	7.1	<1	26.7	89	42.2	3	552	90	332	168	241
		10/03/2021	1,570	0.2	6.8	<1	25.7	119	40.5	2	518	56	318	84	231
		7/04/2021	997	<0.1	4.5	<1	17.7	8	27.5	<1	291	41	216	17	157
		3/05/2021	926	<0.1	4.2	<1	16.6	16	25.8	<1	265	11	203	46	148
		8/06/2021	1,280	<0.1	5.6	<1	21.7	2	34.0	<1	400	96	267	28	194
		7/07/2021	1,230	<0.1	5.5	<1	21.0	2	32.9	<1	380	4	258	8	188
		13/08/2021	1,400	<0.1	6.1	<1	23.4	<1	36.7	<1	448	21	288	12	210
		1/09/2021	1,260	<0.1	5.6	<1	21.4	2	33.6	<1	392	50	264	9	192
		15/10/2021	1,290	<0.1	5.7	<1	21.8	<1	34.2	<1	404	50	269	57	196
		8/11/2021	1,180	<0.1	5.3	<1	20.3	2	31.7	<1	360	24	249	<5	181
		8/12/2021	1,230	<0.1	5.5	<1	21.0	<1	32.9	<1	380	9	258	679	188
		13/01/2022	376	<0.1	1.9	<1	8.0	9	12.0	<1	84	70	94	78	69
		10/02/2022	806	<0.1	3.7	<1	14.9	<1	23.0	<1	222	73	180	5	131
		18/03/2022	131	<0.1	0.7	<1	3.3	6	4.9	<1	22	61	39	22	28
		25/05/2022	543	<0.1	2.6	<1	10.7	18	16.4	<1	135	1	129	6	94
		27/06/2022	569	<0.1	2.7	<1	11.2	3	17.1	<1	143	2	134	6	98
		20/07/2022	366	<0.1	1.9	<1	7.8	8	11.7	<1	81	<1	92	6	67
	Construction	15/08/2022	516	<0.1	2.5	<1	10.3	4	15.7	<1	126	<1	123	7	90
		19/09/2022	485	<0.1	2.4	<1	9.8	4	14.9	<1	117	<1	117	6	85
		20/10/2022	575	<0.1	2.8	<1	11.3	5	17.2	<1	145	1	135	<5	98
		16/11/2022	555	<0.1	2.7	<1	10.9	2	16.7	<1	138	<1	131	<5	96
		16/12/2022	360	<0.1	1.8	<1	7.7	3	11.6	<1	80	2	91	12	66
		8/02/2023	380	<0.1	1.9	<1	8.0	6	12.1	<1	85	1	95	7	69
		3/03/2023	437	<0.1	2.2	<1	9.0	4	13.6	<1	102	2	107	125	78
		4/04/2023	427	<0.1	2.1	<1	8.8	5	13.4	<1	99	6	105	10	76
		2/05/2023	397	<0.1	2.0	<1	8.3	5	12.6	<1	90	10	99	26	72
		7/07/2023	447	<0.1	2.2	1	9.2	5	13.9	<1	105	2	109	12	79
		9/08/2023	470	<0.1	2.3	<1	9.5	2	14.5	<1	112	2	114	6	83
		5/09/2023	503	<0.1	2.5	<1	10.1	9	15.4	<1	122	2	121	9	88
		6/10/2023	508	<0.1	2.5	<1	10.2	4	15.5	<1	124	6	122	18	89
		8/11/2023	512	<0.1	2.5	<1	10.2	7	15.6	<1	125	5	123	18	89
		6/12/2023	511	<0.1	2.5	<1	10.2	<1	15.6	<1	125	2	122	7	89
		19/01/2024	535	<0.1	2.6	<1	10.6	2	16.2	<1	132	1	127	6	93
		13/02/2024	515	<0.1	2.5	<1	10.3	1	15.7	<1	126	1	123	10	90
		15/03/2024	568	<0.1	2.7	<1	11.2	3	17.1	<1	142	2	134	11	97



Appendix B
Table B8
Heavy Metal Concentrations
and Hardness-Modified Trigger Values (HMTV)

Transport for NSW
M12 Motorway
Groundwater Monitoring Program

Well ID	Phase	Date	Hardness mg/L	Cadmium µg/L		Chromium µg/L		Copper µg/L		Lead µg/L		Nickel µg/L		Zinc µg/L	
ANZECC (2000) Freshwater Trigger Value				0.2	HMTV	1.0	HMTV	1.4	HMTV	3.4	HMTV	11	HMTV	8	HMTV
BH112 / BH112R	Baseline	10/09/2020	1,740	<0.1	7.4	<1	27.9	80	44.2	1	590	80	347	104	252
		9/10/2020	1,640	0.2	7.0	<1	26.6	110	42.0	3	548	62	330	146	240
		8/12/2020	1,700	<0.1	7.3	<1	27.4	4	43.3	<1	573	101	340	149	247
		14/01/2021	1,720	<0.1	7.3	<1	27.7	7	43.7	<1	582	120	344	35	250
		11/02/2021	1,700	<0.1	7.3	<1	27.4	1	43.3	<1	573	48	340	11	247
		10/03/2021	1,710	<0.1	7.3	<1	27.5	186	43.5	2	577	40	342	86	249
		7/04/2021	402	<0.1	2.0	<1	8.4	11	12.7	<1	92	36	100	9	73
		4/05/2021	792	<0.1	3.7	<1	14.6	4	22.6	<1	217	182	178	58	129
		8/06/2021	804	<0.1	3.7	<1	14.8	1	22.9	<1	221	56	180	34	131
		7/07/2021	825	<0.1	3.8	<1	15.1	2	23.4	<1	229	10	184	7	134
		13/08/2021	972	<0.1	4.4	<1	17.3	2	26.9	<1	282	43	212	29	154
		1/09/2021	957	<0.1	4.4	<1	17.1	2	26.6	<1	276	38	209	10	152
		15/10/2021	1,690	<0.1	7.2	3	27.3	86	43.1	4	569	71	338	118	246
		8/11/2021	1,180	<0.1	5.3	<1	20.3	3	31.7	<1	360	33	249	7	181
		8/12/2021	1,210	<0.1	5.4	<1	20.7	2	32.4	<1	372	50	255	655	185
		13/01/2022	1,180	<0.1	5.3	<1	20.3	<1	31.7	<1	360	65	249	14	181
		10/02/2022	1,340	<0.1	5.9	<1	22.5	1	35.4	<1	424	141	278	13	202
		18/03/2022	364	<0.1	1.8	<1	7.7	<1	11.7	<1	81	130	92	<5	67
		25/05/2022	286	<0.1	1.5	<1	6.4	3	9.5	<1	60	7	75	22	54
		27/06/2022	264	<0.1	1.4	<1	5.9	<1	8.9	<1	54	<1	70	<5	51
		20/07/2022	251	<0.1	1.3	<1	5.7	4	8.5	<1	50	<1	67	5	49
	Construction	15/08/2022	261	<0.1	1.4	<1	5.9	3	8.8	<1	53	<1	69	<5	50
		19/09/2022	268	<0.1	1.4	<1	6.0	2	9.0	<1	55	<1	71	<5	51
		20/10/2022	283	<0.1	1.5	<1	6.3	6	9.4	<1	59	5	74	49	54
		16/11/2022	260	<0.1	1.4	<1	5.9	3	8.8	<1	53	1	69	<5	50
		9/08/2023	2630	<0.1	10.7	<1	39.2	1	62.7	<1	997	18	493	8	359
		5/09/2023	2360	<0.1	9.7	<1	35.9	13	57.2	<1	869	47	450	19	327
		6/10/2023	2290	<0.1	9.5	<1	35.0	16	55.8	<1	837	16	438	48	319
		8/11/2023	2100	<0.1	8.8	<1	32.6	6	51.8	<1	749	9	407	12	296
		6/12/2023	2270	<0.1	9.4	<1	34.7	<1	55.4	<1	827	8	435	16	316
		19/01/2024	2460	<0.1	10.1	<1	37.1	4	59.3	<1	916	7	466	13	339
BH145	Baseline	13/02/2024	1930	<0.1	8.1	<1	30.4	6	48.2	<1	673	7	379	14	276
		15/03/2024	2330	<0.1	9.6	<1	35.5	9	56.6	<1	855	6	445	17	323
		9/09/2020	223	0.1	1.2	<1	5.2	153	7.7	2	43	129	61	2620	44
		8/10/2020	264	<0.1	1.4	<1	5.9	8	8.9	<1	54	20	70	643	51
		11/11/2020	65	<0.1	0.4	<1	1.9	4	2.7	<1	9	43	21	10700	15
		9/12/2020	65	<0.1	0.4	<1	1.9	<1	2.7	<1	9	82	21	1330	15
		12/01/2021	88	<0.1	0.5	4	2.4	42	3.5	14	13	11	27	1030	20
		9/02/2021	80	<0.1	0.5	<1	2.2	17	3.2	<1	12	8	25	1620	18
		10/03/2021	119	<0.1	0.7	<1	3.1	62	4.5	<1	20	68	35	297	26
		7/04/2021	65	<0.1	0.4	<1	1.9	7	2.7	<1	9	13	21	1380	15
		1/09/2021	211	0.4	1.1	<1	5.0	4	7.3	<1	40	46	58	694	42
		15/10/2021	86	<0.1	0.5	<1	2.4	<1	3.4	<1	13	<1	27	<5	20
		8/11/2021	234	0.2	1.2	<1	5.4	15	8.0	<1	46	28	63	556	46
		8/12/2021	228	0.5	1.2	<1	5.3	<1	7.8	<1	45	14	62	568	45
		13/01/2022	154	<0.1	0.9	<1	3.8	<1	5.6	<1	27	8	44	824	32
		10/02/2022	131	0.1	0.7	<1	3.3	2	4.9	<1	22	6	39	498	28
		18/03/2022	149	0.1	0.8	<1	3.7	5	5.5	<1	26	6	43	567	31
		25/05/2022	106	<0.1	0.6	<1	2.8	6	4.1	<1	17	4	32	210	23
		27/06/2022	113	<0.1	0.7	<1	3.0	2	4.3	<1	18	2	34	142	25
		20/07/2022	48	<0.1	0.3	<1	1.5	2	2.1	<1	6	3	16	138	12
	Construction	15/08/2022	60	<0.1	0.4	<1	1.8	1	2.5	<1	8	3	20	102	14
		19/09/2022	97	<0.1	0.6	<1	2.6	2	3.8	<1	15	2	30	75	22
		20/10/2022	215	<0.1	1.2	<1	5.0	7	7.5	<1	41	3	59	101	43
		15/11/2022	70	<0.1	0.4	<1	2.0	5	2.9	<1	10	2	23	68	16
		14/12/2022	94	<0.1	0.6	<1	2.6	4	3.7	<1	15	2	29	72	21
		7/02/2023	118	<0.1	0.7	<1	3.1	3	4.5	<1	19	3	35	61	26
BH145R	Construction	5/04/2023	974	<0.1	4.4	<1	17.4	<1	27.0	<1	282	26	212	<5	154
		2/05/2023	1170	<0.1	5.2	<1	20.2	<1	31.5	<1	357	5	248	6	180
		6/06/2023	1580	<0.1	6.8	<1	25.8	<1	40.7	<1	522	2	320	<5	232
		7/07/2023	1830	<0.1	7.8	<1	29.1	2	46.1	<1	629	1	362	<5	263
		9/08/2023	2380	<0.1	9.8	<1	36.1	1	57.6	<1	879	<1	453	<5	329
		6/09/2023	2090	<0.1	8.7	<1	32.5	1	51.6	<1	745	25	405	6	295
		6/10/2023	2510	<0.1	10.3	<1	37.7	<1	60.3	<1	940	22	474	23	345
		9/11/2023	2500	<0.1	10.2	<1	37.6	<1	60.1	<1	935	<1	472	5	343
		5/12/2023	2610	<0.1	10.6	<1	38.9	<1	62.3	<1	988	<1	490	<5	356
		19/01/2024	2890	<0.1	11.7	<1	42.3	<1	68.0	<1	1124	1	534	<5	388
		14/02/2024	2460	<0.1	10.1	<1	37.1	<1	59.3	<1	916	1	466	<5	339
		14/03/2024	2920	<0.1	11.8	<1	42.7	<1	68.6	<1	1139	<1	539	<5	392

Note:

Heavy metal concentrations equal to or exceeds HMTV



Appendix B
Table B9
Groundwater Gauging Results - Current Monitoring Period (October 2023 to March 2024)

Transport for NSW
M12 Motorway
M12 Motorway Groundwater Monitoring Program

Package	Well ID	Sampling Event	Sampled	Date monitored	SWL (mbTOC)	Base (mbTOC)	Data logger present?	Data logger recorded?	Comments
West	BH104R	Event 55 - October 2023	Yes	6/10/2023	11.790	18.150	Yes	Yes	
West	BH104R	Event 56 - November 2023	Yes	8/11/2023	11.620	18.140	Yes	Yes	Monthly monitoring round.
West	BH104R	Event 57 - December 2023	Yes	6/12/2023	11.465	18.140	Yes	Yes	
West	BH104R	Event 58 - January 2024	Yes	19/01/2024	11.135	18.140	Yes	Yes	Monthly monitoring round.
West	BH104R	Event 59 - February 2024	Yes	13/02/2024	11.075	18.125	Yes	Yes	
West	BH104R	Event 60 - March 2024	Yes	15/03/2024	11.050	18.205	Yes	Yes	Monthly monitoring round.
West	BH107R	Event 55 - October 2023	Yes	6/10/2023	7.698	14.610	Yes	Yes	
West	BH107R	Event 56 - November 2023	Yes	8/11/2023	7.800	14.490	Yes	Yes	Monthly monitoring round.
West	BH107R	Event 57 - December 2023	Yes	6/12/2023	7.810	14.505	Yes	Yes	
West	BH107R	Event 58 - January 2024	Yes	19/01/2024	7.760	14.500	Yes	Yes	Monthly monitoring round.
West	BH107R	Event 59 - February 2024	Yes	13/02/2024	7.730	14.490	Yes	Yes	
West	BH107R	Event 60 - March 2024	Yes	15/03/2024	7.795	14.560	Yes	Yes	Monthly monitoring round.
West	BH112R	Event 55 - October 2023	Yes	6/10/2023	12.700	21.110	Yes	Yes	
West	BH112R	Event 56 - November 2023	Yes	8/11/2023	12.905	21.110	Yes	Yes	Monthly monitoring round.
West	BH112R	Event 57 - December 2023	Yes	6/12/2023	13.020	21.120	Yes	Yes	
West	BH112R	Event 58 - January 2024	Yes	19/01/2024	13.045	21.110	Yes	Yes	Monthly monitoring round.
West	BH112R	Event 59 - February 2024	Yes	13/02/2024	13.095	21.095	Yes	Yes	
West	BH112R	Event 60 - March 2024	Yes	15/03/2024	13.141	21.180	Yes	Yes	Monthly monitoring round.
Central	BH145R	Event 55 - October 2023	Yes	6/10/2023	11.760	19.980	Yes	Yes	
Central	BH145R	Event 56 - November 2023	Yes	9/11/2023	11.650	19.970	Yes	Yes	Monthly monitoring round.
Central	BH145R	Event 57 - December 2023	Yes	5/12/2023	11.525	19.970	Yes	Yes	
Central	BH145R	Event 58 - January 2024	Yes	19/01/2024	11.260	19.950	Yes	Yes	Monthly monitoring round.
Central	BH145R	Event 59 - February 2024	Yes	14/02/2024	11.300	19.935	Yes	Yes	
Central	BH145R	Event 60 - March 2024	Yes	14/03/2024	11.270	20.010	Yes	Yes	Monthly monitoring round.
Central	BH219	Event 55 - October 2023	Yes	4/10/2023	0.495	18.280	Yes	Yes	
Central	BH219	Event 57 - December 2023	Yes	5/12/2023	0.380	18.280	Yes	Yes	
Central	BH219	Event 59 - February 2024	Yes	14/02/2024	0.565	18.236	Yes	Yes	
Central	WSP_BH06	Event 55 - October 2023	Yes	4/10/2023	7.430	10.820	No	No	A monitoring well adjacent to the sealed local road from Clifton Ave, near the M12 site. Have not previously travelled down this road.
East	BH155	Event 55 - October 2023	Yes	4/10/2023	DRY	-	-	-	
East	BH155	Event 57 - December 2023	No	5/12/2023	-	-	-	-	Destroyed
East	BH162	Event 55 - October 2023	Yes	4/10/2023	6.075	18.200	Yes	Yes	
East	BH162	Event 57 - December 2023	No	5/12/2023	-	-	-	-	Confirmed destroyed, JH cleared vegetation and access track first observed November.
East	BH170	Event 55 - October 2023	No	4/10/2023	-	-	-	-	Not located.
East	BH170	Event 57 - December 2023	No	5/12/2023	-	-	-	-	Not located.
East	BH170	Event 59 - February 2024	No	14/02/2024	-	-	-	-	Not located.
East	BH175	Event 55 - October 2023	Yes	4/10/2023	4.631	17.940	Yes	Yes	
East	BH175	Event 57 - December 2023	Yes	5/12/2023	4.920	17.940	Yes	Yes	
East	BH175	Event 59 - February 2024	Yes	14/02/2024	5.143	17.861	Yes	Yes	Not likely to be impacted by future works, track maintenance, clearing, and earthworks visible near the location.

Appendix C

Field Parameter Graphs

Groundwater Quality Parameter Graphs

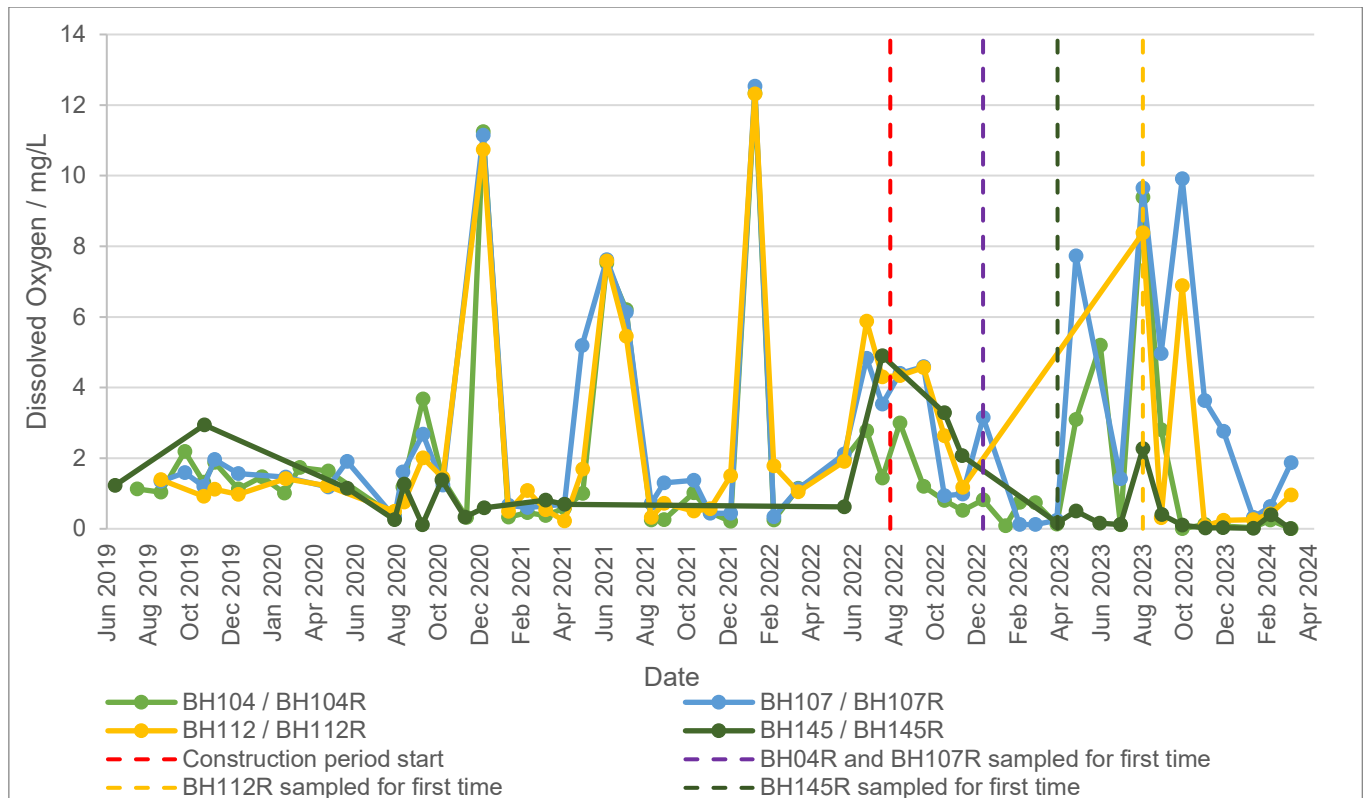


Figure 1 Dissolved oxygen in groundwater wells over time

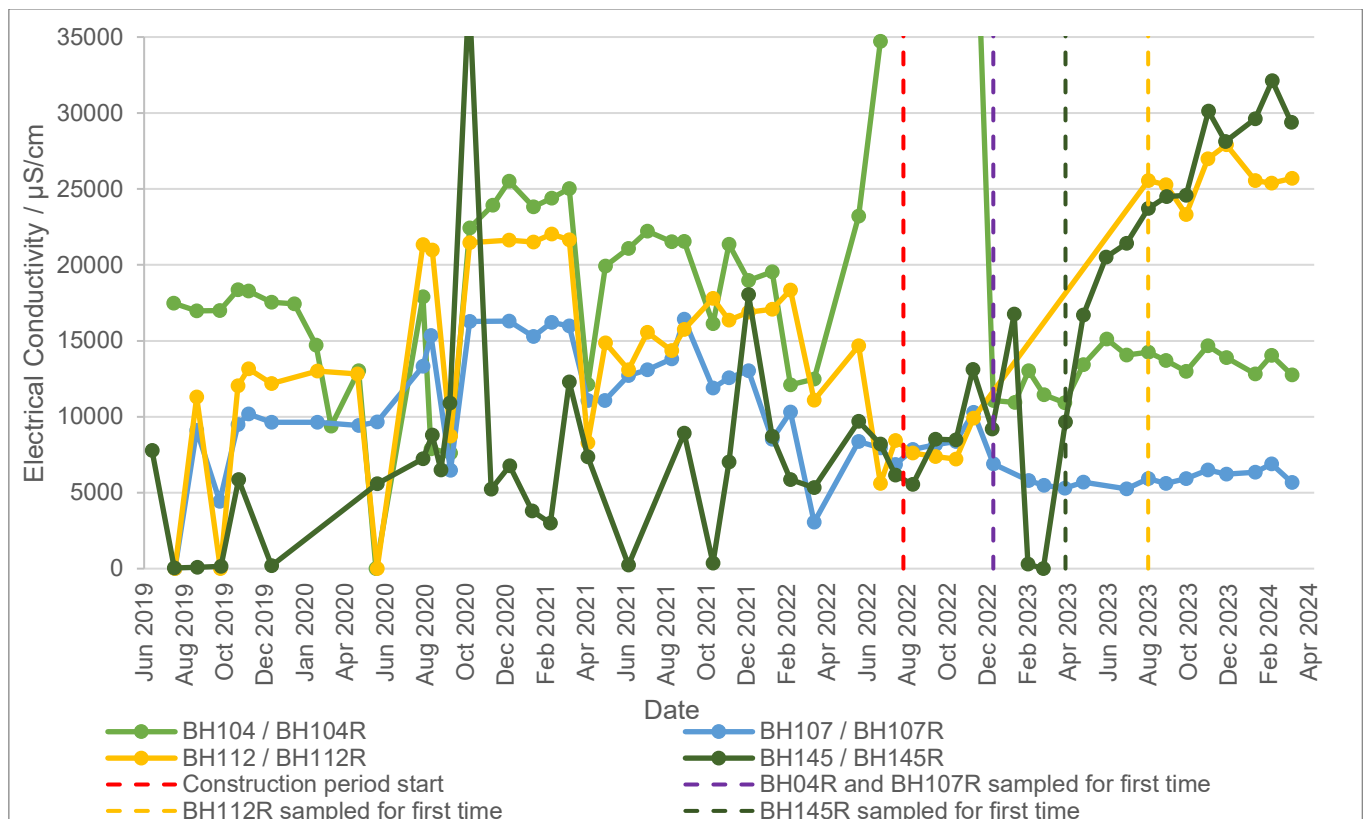


Figure 2 Electrical conductivity in groundwater wells over time

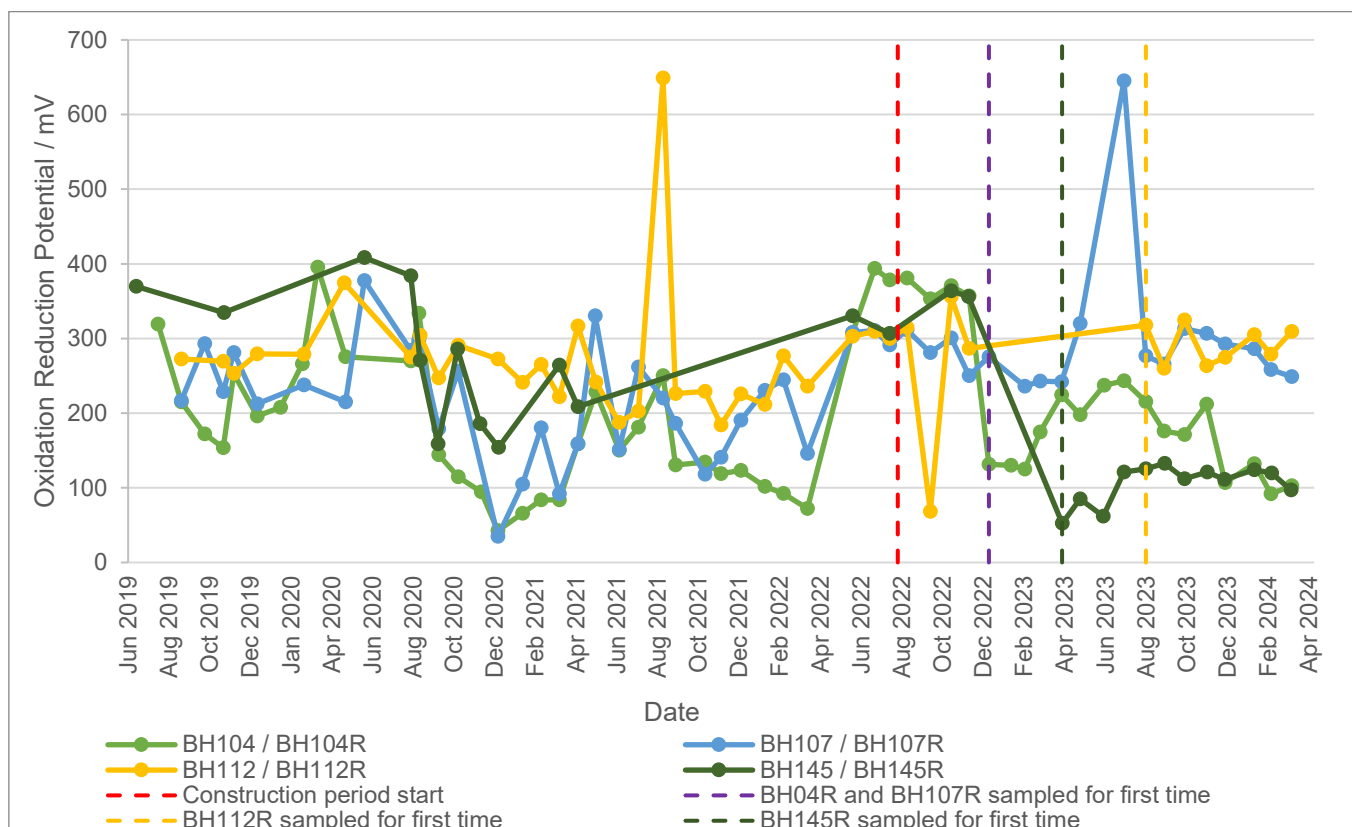


Figure 3 Redox in groundwater wells over time

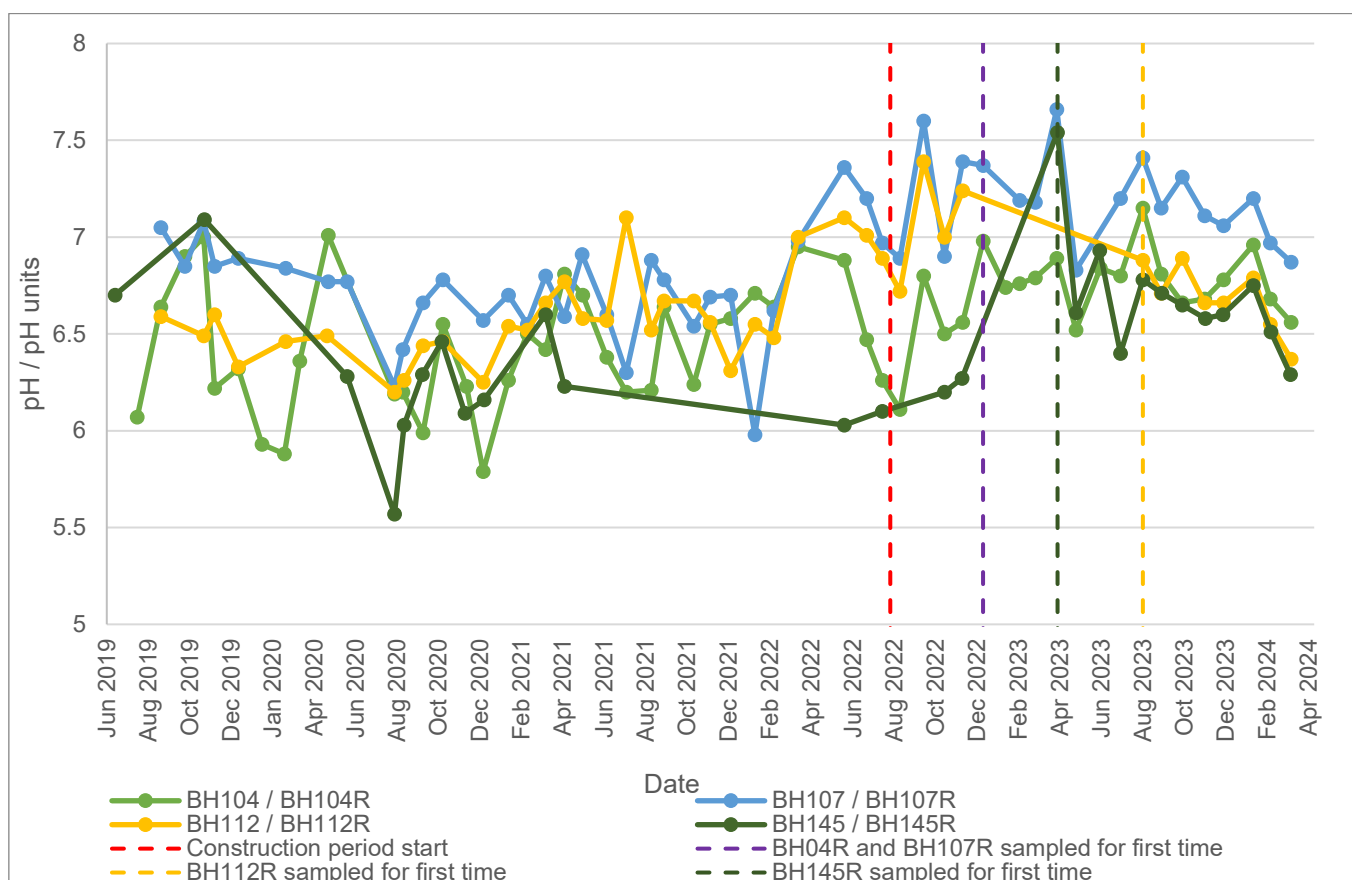


Figure 4 pH in groundwater wells over time

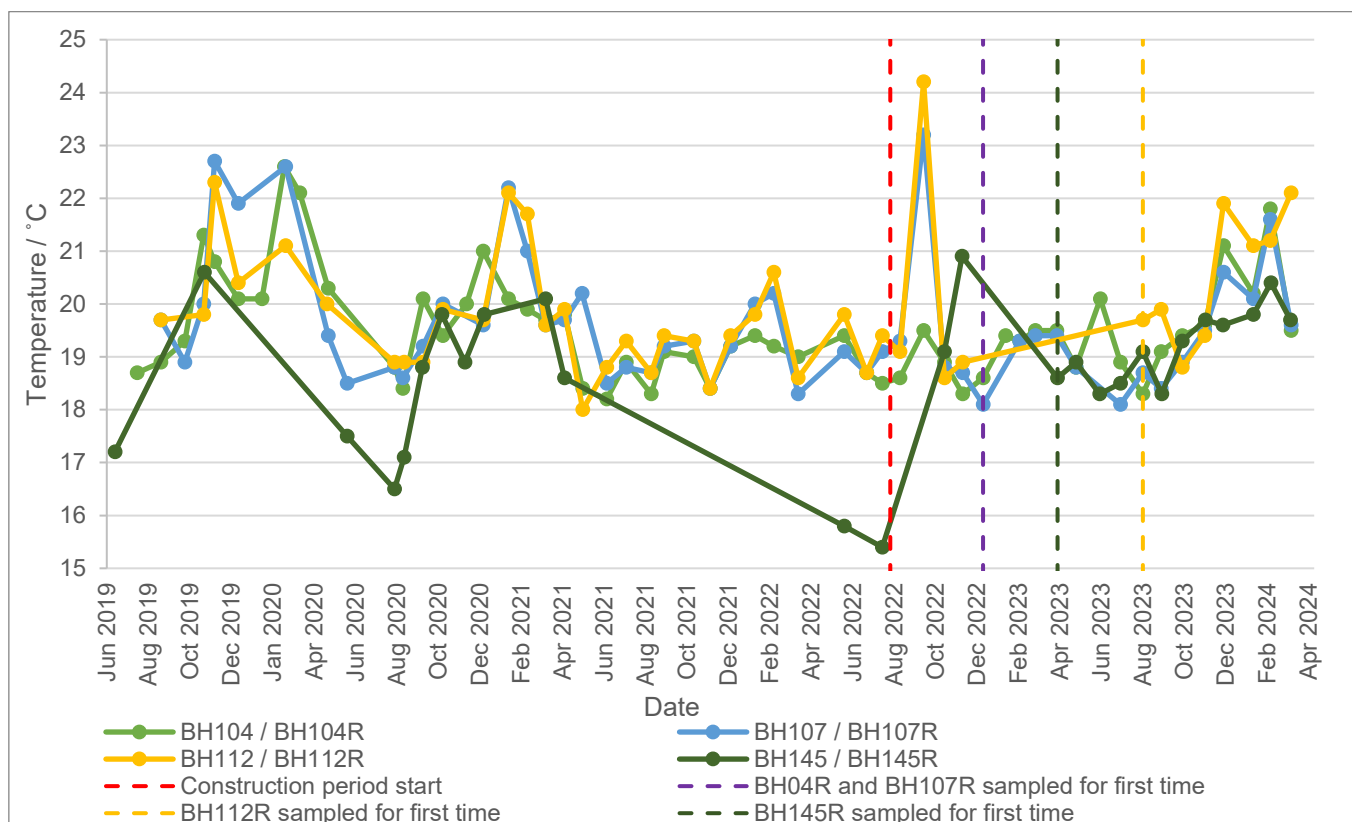


Figure 5 Temperature in groundwater wells over time

Appendix D

Boxplot Graphs

Boxplot graphs for selected analytes

pH

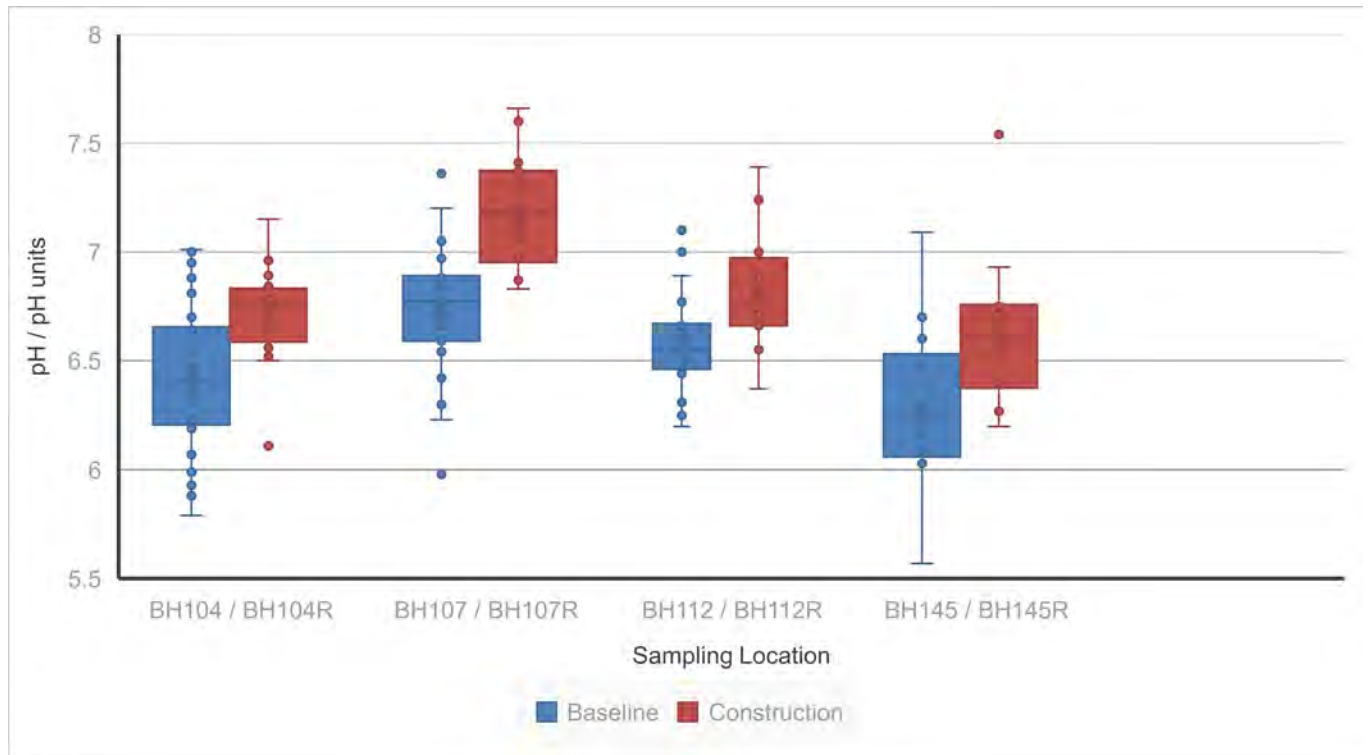


Figure 1 Summary of field recorded pH for the baseline and construction phases to March 2024

Electrical Conductivity

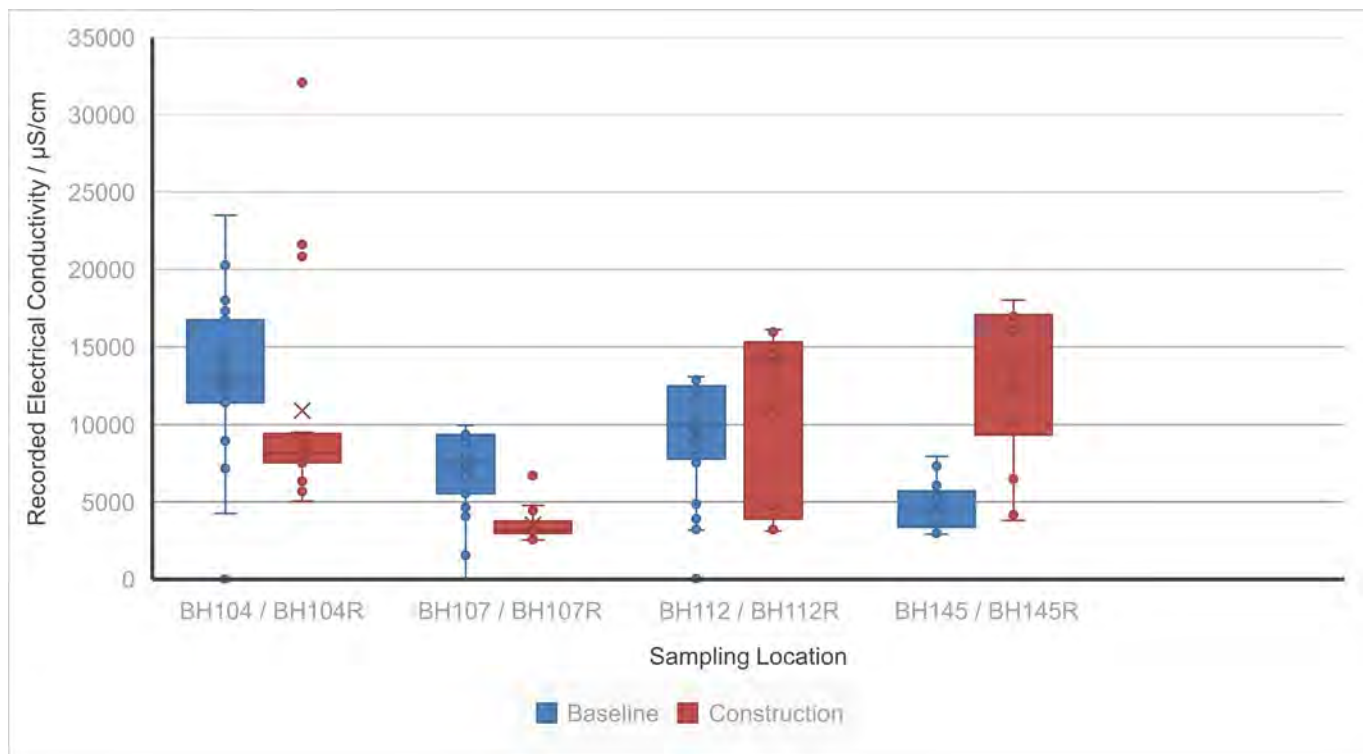
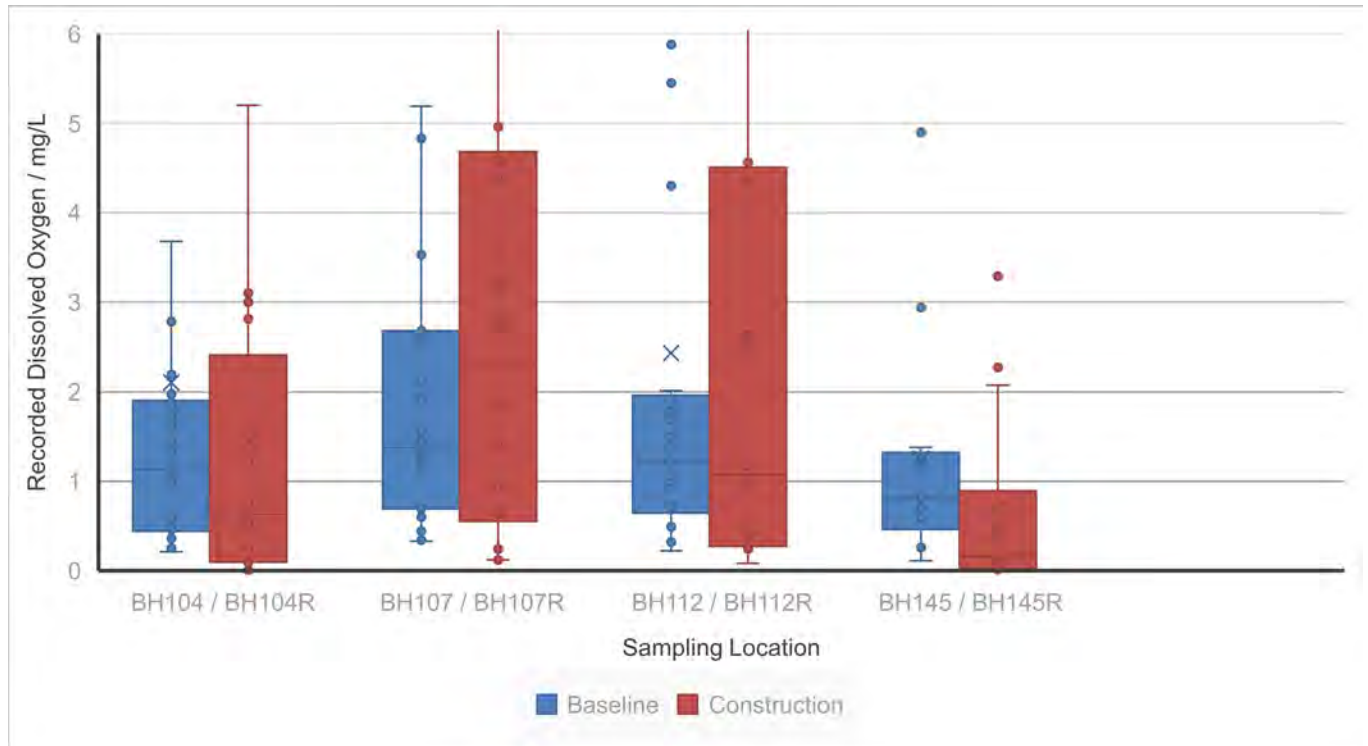


Figure 2 Summary of field recorded electrical conductivity for the baseline and construction phases to March 2024

Dissolved Oxygen



Note: Some outliers have been hidden

Figure 3 Summary of field recorded dissolved oxygen for the baseline and construction phases to March 2024

Total Dissolved Solids

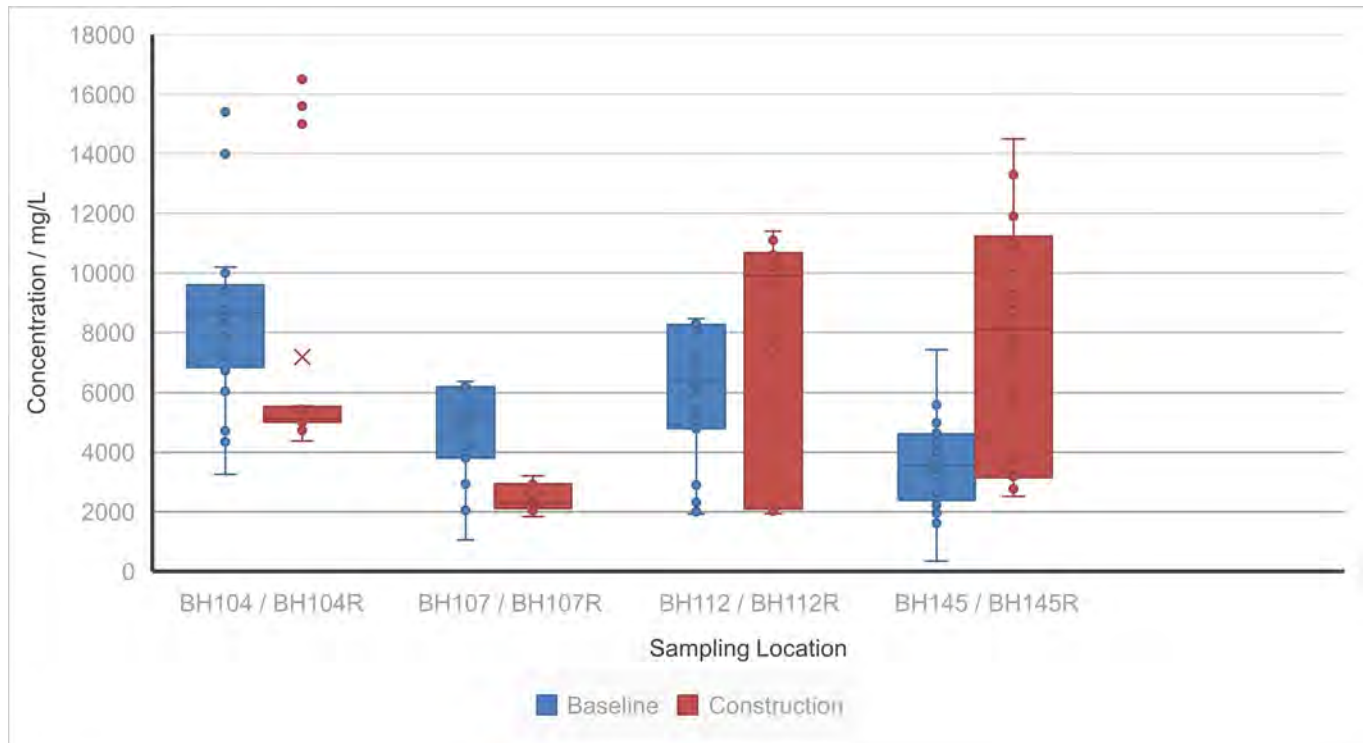
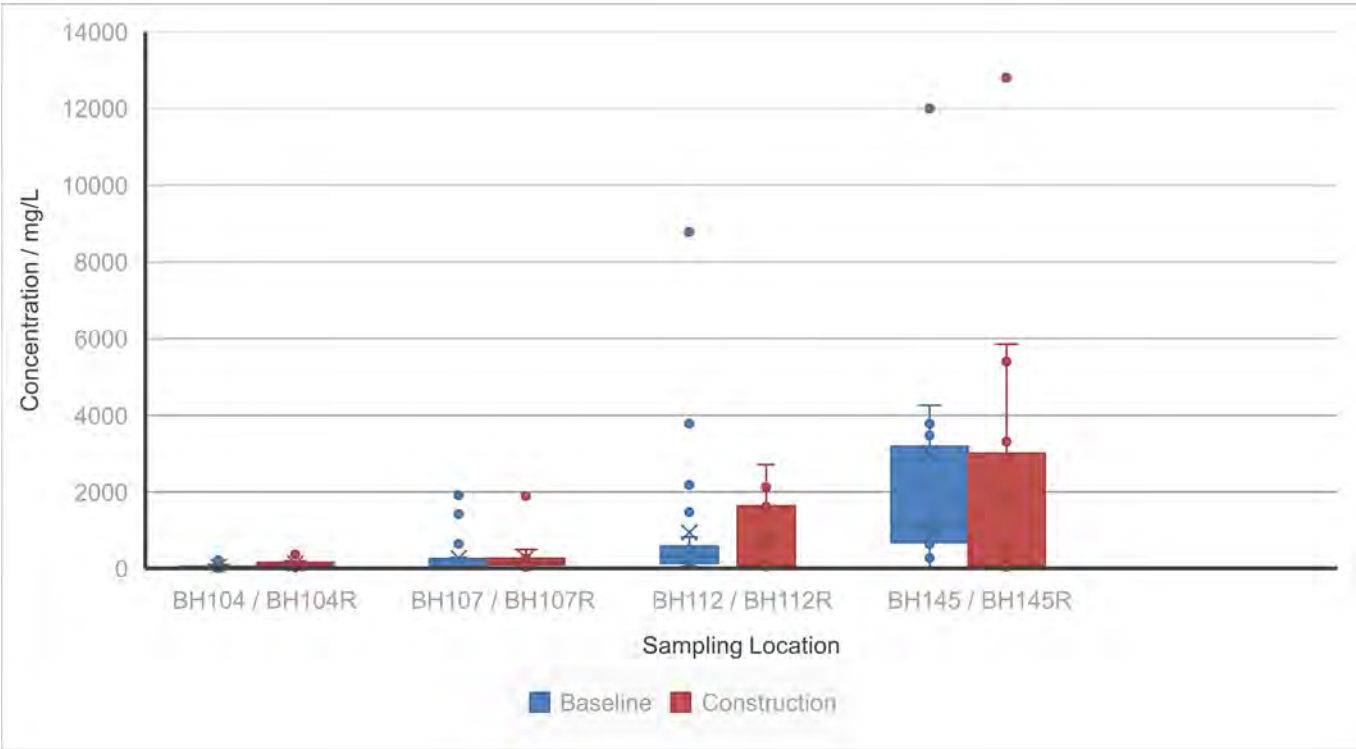


Figure 4 Summary of total dissolved solids concentrations for the baseline and construction phases to March 2024

Total Suspended Solids



Note: Some outliers have been hidden
Figure 5 Summary of total suspended solids concentrations for the baseline and construction phases to March 2024

Ammonia

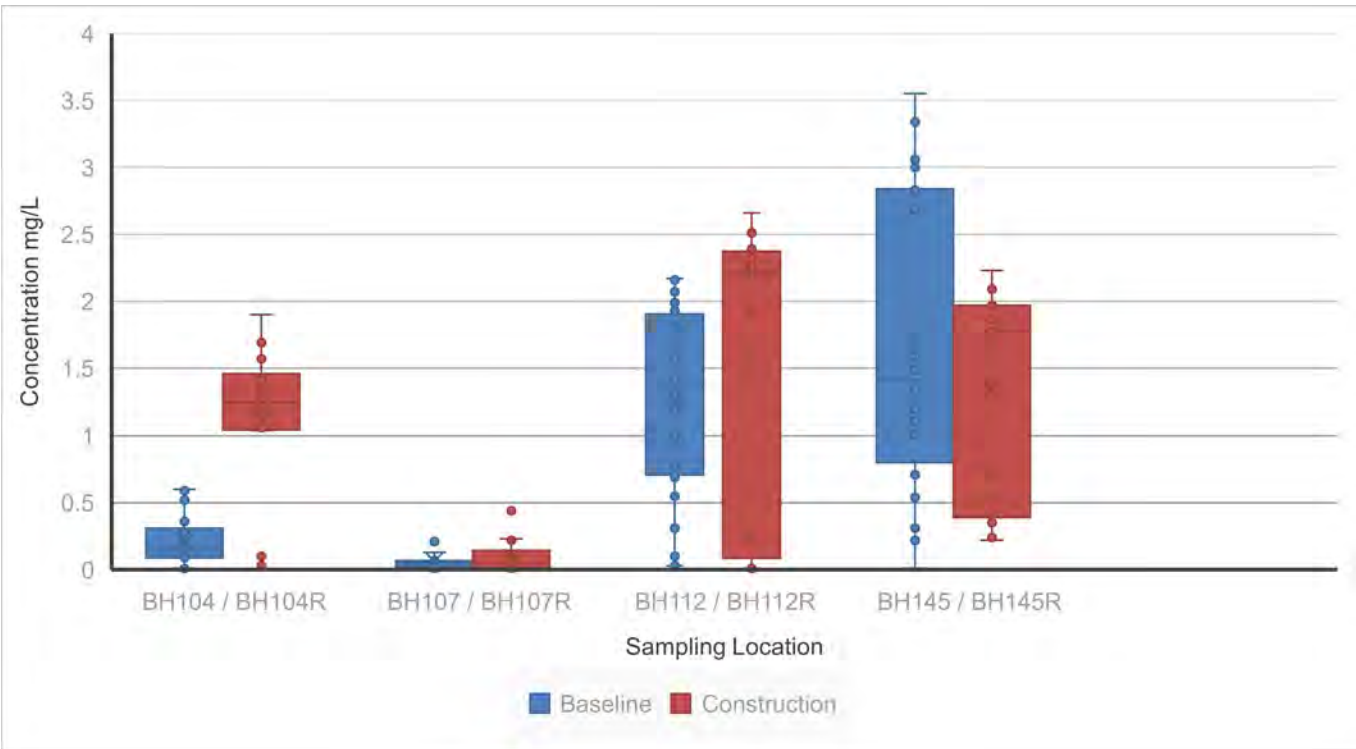


Figure 6 Summary of ammonia concentrations for the baseline and construction phases to March 2024

Nitrate

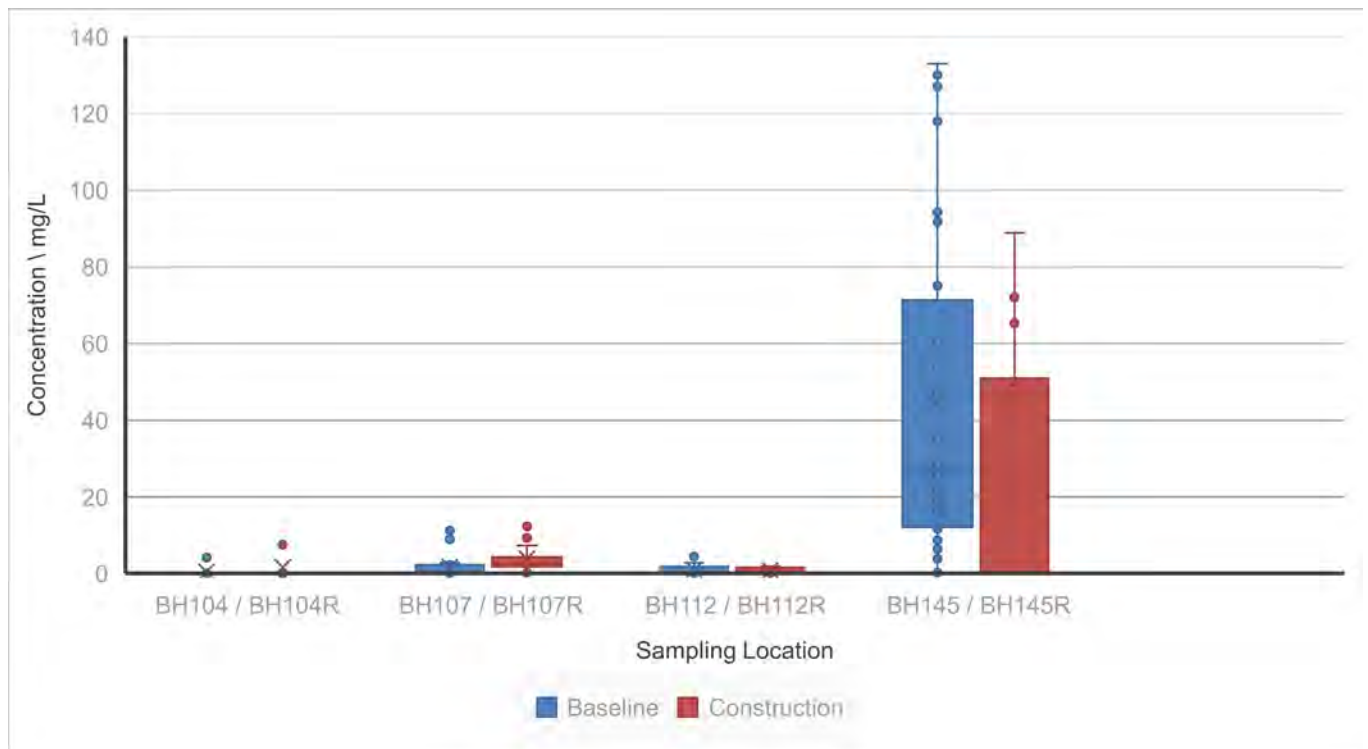


Figure 7 Summary of nitrate concentrations for the baseline and construction phases to March 2024

Total Oxidised Nitrogen

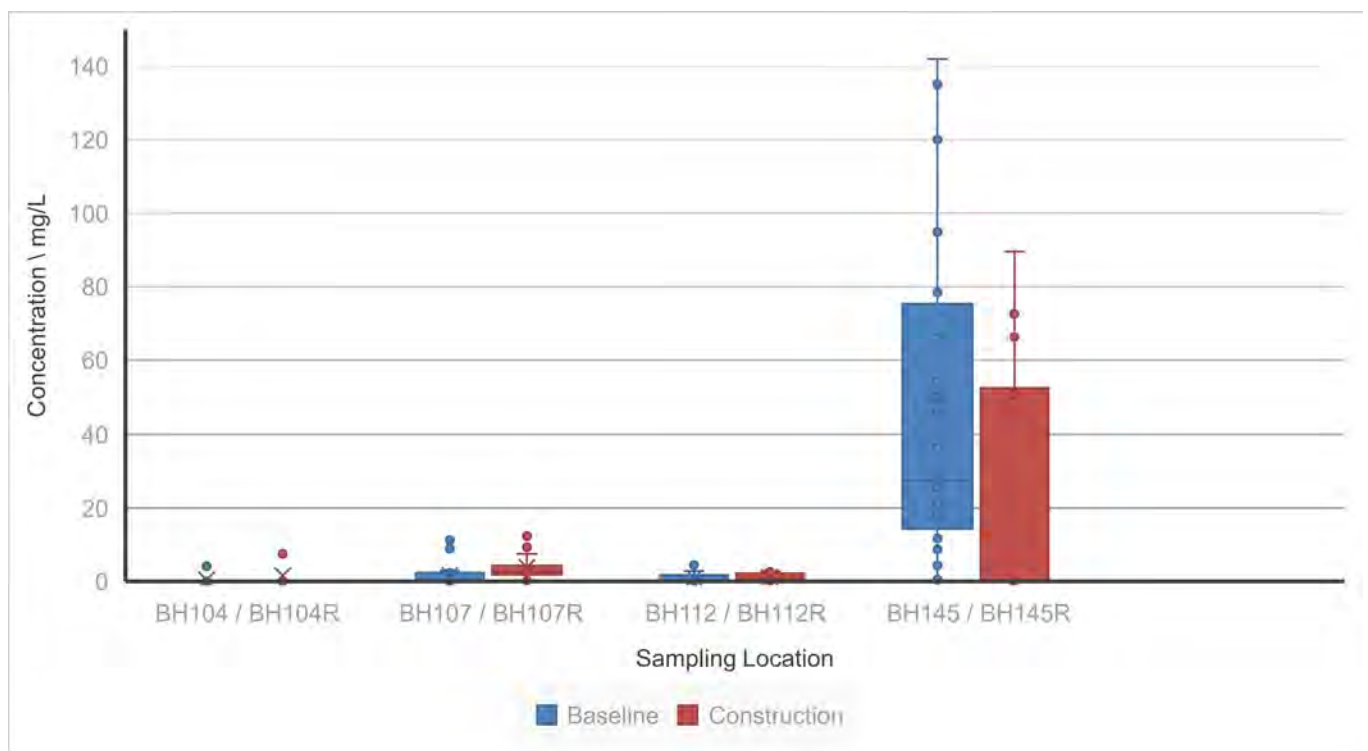


Figure 8 Summary of total oxidised nitrogen concentrations for the baseline and construction phases to March 2024

Total Nitrogen

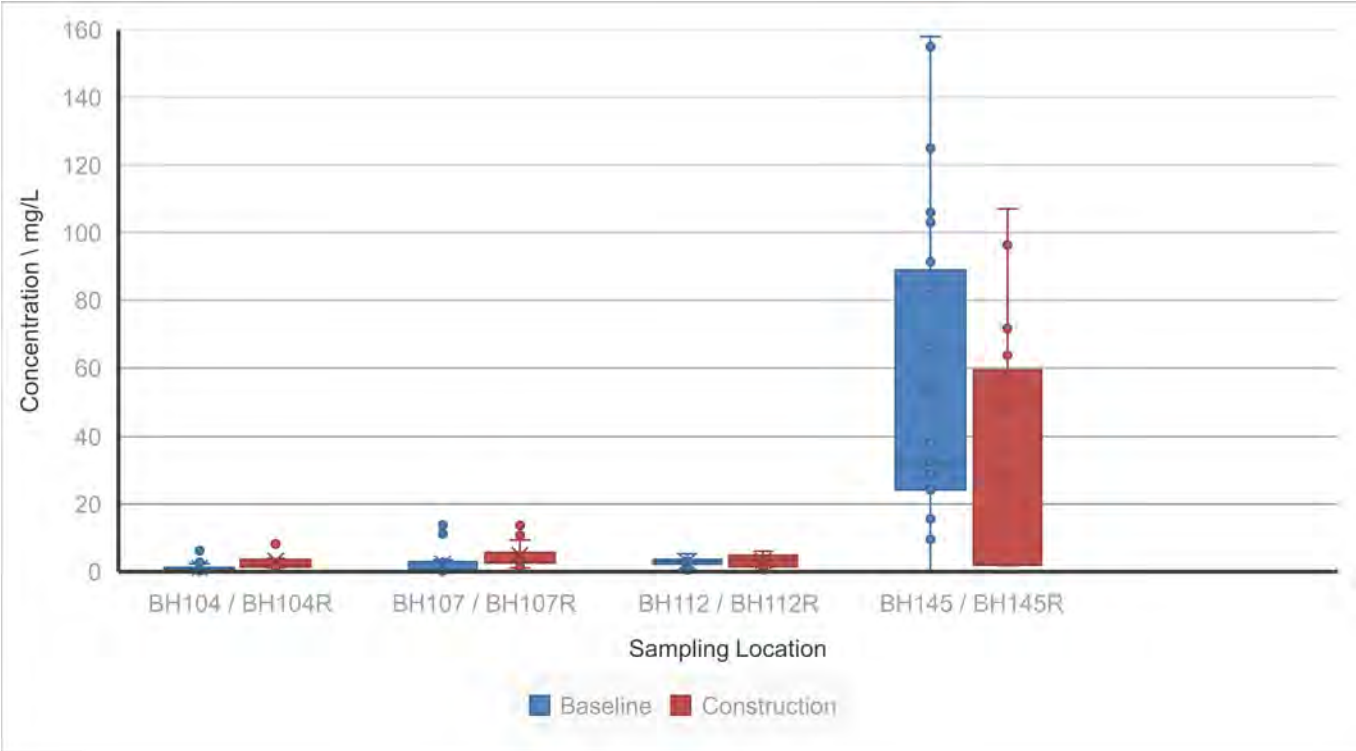
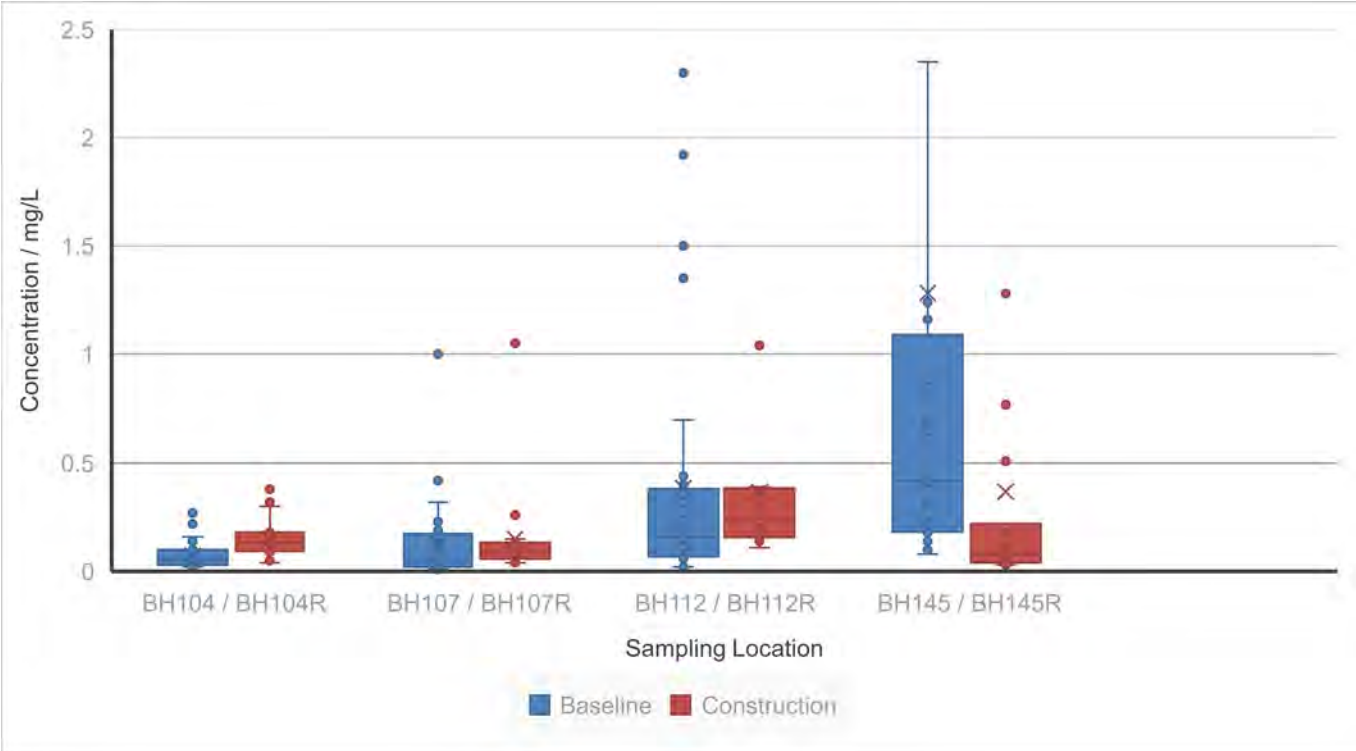


Figure 9 Summary of total nitrogen concentrations for the baseline and construction phases to March 2024

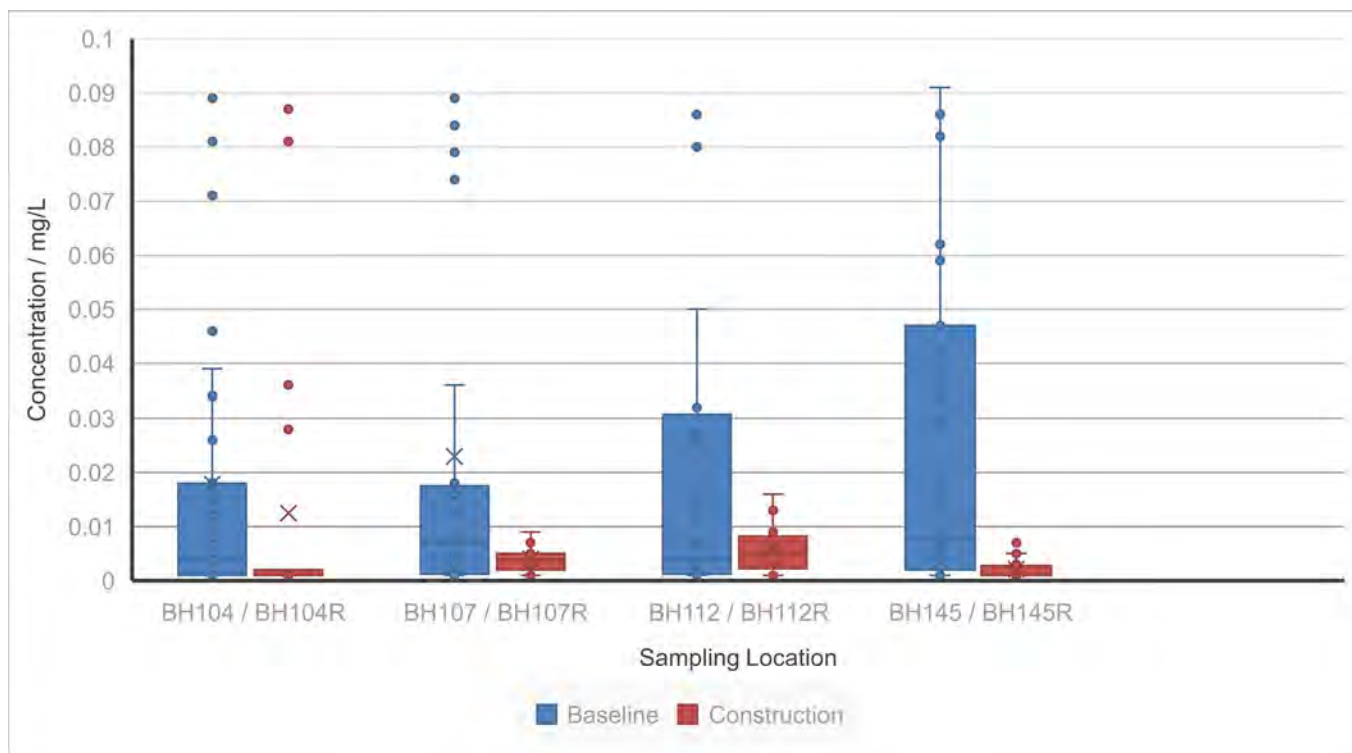
Phosphorus



Note: Some outliers have been hidden

Figure 10 Summary of phosphorus concentrations for the baseline and construction phases to March 2024

Copper



Note: Some outliers have been hidden

Figure 11 Summary of copper concentrations for the baseline and construction phases to March 2024

Manganese

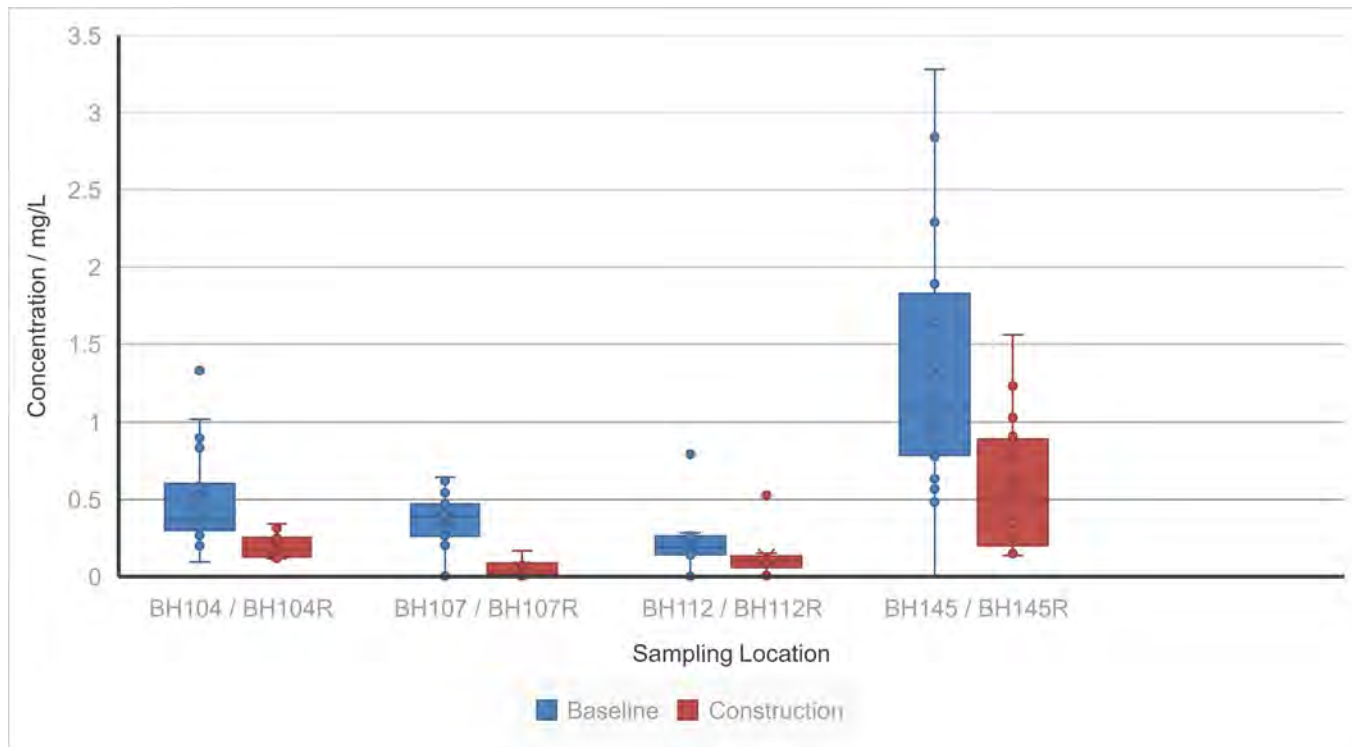


Figure 12 Summary of manganese concentrations for the baseline and construction phases to March 2024

Appendix E

Calibration certificates

Multi Parameter Water Meter

Instrument **YSI Pro DSS**
Serial No. **21K101474**



Air-Met Scientific Pty Ltd
1300 137 067

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

Certificate of Calibration

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

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. EC		2760uS/cm		401089	2769uS/cm
2. Temp		23.6°C		Testo	23.6°C
3. pH 4		pH 4.00		399527	pH 3.99
4. pH 7		pH 7.00		399304	pH 6.95
5. DO		0.0%		12110	-0.1%
6. Turbidity		100 NTU		406442	99.7NTU
7. ORP		232.08mV		A405006/B398193	232.1mV

Calibrated by: Guido Camera

Calibration date: **29/09/2023**

Next calibration due: **29/10/2023**

Oil / Water Interface Meter

Instrument **Interface Meter (30M)**
Serial No. **288043**



Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
	above 7.9V	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check Connectors	Cleaned	✓	
	Checked for cuts	✓	
Instrument Test			
	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Tested by: _____ **Sara Angelini**

Test date: **26/09/2023**

Next Test due: **25/12/2023**

Oil / Water Interface Meter

Instrument **Geotech Interface Meter (60m)**
 Serial No. **3961**



Air-Met Scientific Pty Ltd
 1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	8.84 V
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors			
Tape Check	Cleaned	✓	
Connectors	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: _____ **Samuel Tanner**

Calibration date: **03-Nov-23**

Next calibration due: **02-Jan-24**

Multi Parameter Water Meter

Instrument **YSI Pro DSS**
Serial No. **21K101479**



Air-Met Scientific Pty Ltd
1300 137 067

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

Certificate of Calibration

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

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. EC		2760uS/cm		401089	2766uS/cm
2. Temp		20.8°C		Instrument Temp	20.8°C
3. pH 4		pH 4.00		399527	pH 3.97
4. pH 7		pH 7.00		399304	pH 6.97
5. DO		0.00%		399958	-0.3%
6. Turbidity		100NTU		406442	99.3NTU
7. ORP		238.24mV		A393379/B398193	237.6mV

Calibrated by:

Guido Camera

Calibration date:

06/11/2023

Next calibration due:

06/12/2023

Oil / Water Interface Meter

Instrument **Geotech Interface Meter (60M)**
Serial No. **5339**



Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
Connectors	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: Miriam Poyitt

Calibration date: **28/11/2023**

Next calibration due: **26/05/2024**

Multi Parameter Water Meter

Instrument **YSI Pro DSS**
Serial No. **15J100066**



Air-Met Scientific Pty Ltd
1300 137 067

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

Certificate of Calibration

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

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
7. Turbidity		100NTU		413978	99.51NTU
1. EC		2760mS		406852	2762mS
3. pH 4		pH 4.00		405966	pH 3.99
4. pH 7		pH 7.00		406263	pH 7.05
5. Temperature		21.3°C		Reading	21.3°C
6. DO		0%		407802	-0.3%
8. mV		237.14mV		A405006/B398193	237.2mV

Calibrated by: Samuel Tanner

Calibration date: **30/11/2023**

Next calibration due: **30/12/2023**

Multi Parameter Water Meter

Instrument **YSI Pro DSS**
Serial No. **21K104041**



Air-Met Scientific Pty Ltd
1300 137 067

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

Certificate of Calibration

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

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. EC		2760 mS		385789	2759mS
2. Temp		21.2°C		Testo	21.2°C
3. pH 4		pH 4.00		394432	pH 4.03
4. pH 7		pH 7.00		393774	pH 7.02
6. DO		0.00%		391223	-0.1%
7. Turbidity		100NTU		396421	99.00NTU
8. mV		237.36mV		395557/398763	237.0mV

Calibrated by: Olivia Hadley

Calibration date: **10/01/2024**

Next calibration due: **9/02/2024**

Oil / Water Interface Meter

Instrument **Geotech Interface Meter (60M)**
 Serial No. **3953**



airmet

Air-Met Scientific Pty Ltd
 1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
Connectors	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: Samuel Tanner

Calibration date: **4/12/2023**

Next calibration due: **2/02/2024**

Multi Parameter Water Meter

Instrument **YSI Pro DSS**
Serial No. **21K101478**



Air-Met Scientific Pty Ltd
1300 137 067

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

Certificate of Calibration

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

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. EC		2760uS		414103	2761uS
2. Temp		23.0°C		MultiTherm	22.7°C
3. pH 4		pH 4.00		414104	pH 3.98
4. pH 7		pH 7.00		413995	pH 7.05
5. DO		0.00%		12265	-0.20
6. Turbidity		100NTU		419749	102.43NTU
7. mV		233.4mV		A:406331/B:402268	233.5mV

Calibrated by: Samuel Tanner

Calibration date: 9/02/2024

Next calibration due: 10/03/2024

Oil / Water Interface Meter

Instrument **Geotech Interface Meter (30M)**
 Serial No. **3985**



airmet

Air-Met Scientific Pty Ltd
 1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
Connectors	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: _____ **Miriam Poyitt**

Calibration date: **22/01/2024**

Next calibration due: **22/03/2024**

Oil / Water Interface Meter

Instrument **Geotech Interface Meter (30M)**
 Serial No. **4063**



Air-Met Scientific Pty Ltd
 1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
Connectors	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: _____ **Olivia Hadley**

Calibration date: **7/03/2024**

Next calibration due: **6/05/2024**

Multi Parameter Water Meter

Instrument **YSI Pro DSS**
Serial No. **21K104041**



Air-Met Scientific Pty Ltd
1300 137 067

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

Certificate of Calibration

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

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. EC		2760 mS		414103	2765mS
2. Temp		23.0°C		MultiTherm	22.6°C
3. pH 4		pH 4.00		414104	pH 3.90
4. pH 7		pH 7.00		413995	pH 6.97
6. DO		0.00%		12265	-0.5%
7. Turbidity		100NTU		419749	100.41 NTU
8. mV		233.84mV		406331/402268	233.5mV

Calibrated by: James Osterberg

Calibration date: **6/03/2024**

Next calibration due: **5/04/2024**

Appendix F

**Quality assurance / Quality control
program and assessment**

Data Quality Objectives (DQOs)

The Data Quality Objectives (DQOs) are based on guidance presented in:

- NEPC (2013) National Environment Protection (Assessment of Site Contamination) Amended Measure (NEPM) No. 1 – Schedule B2, Guideline on Site Characterisation.

The DQO process will be applied to the on-going monitoring to ensure that data collection activities are appropriate and achieve the project objectives. The DQO process involves seven steps as follows:

- Step 1: State the Problem
- Step 2: Identify the decision/goal of the study
- Step 3: Identify the information inputs
- Step 4: Define the boundaries of the Study
- Step 5: Develop the analytical approach
- Step 6: Specify performance or acceptance criteria
- Step 7: Develop the plan for obtaining data

An overview of the DQOs for the works are presented in the following steps.

Step 1: State the problem

The M12 Motorway (the project) is located between the M7 Motorway at Cecil Hills, and The Northern Road at Luddenham in Western Sydney, covering approximately 16 km. The intention of the project is to provide direct access between the Western Sydney International Airport at Badgerys Creek and Sydney's motorway network.

As part of the project approval conditions, TfNSW are required to prepare and implement a groundwater monitoring program for the M12 Motorway development to be undertaken during baseline, construction and post construction.

Step 2: Identify the decision/goal of the study

The key goal of the baseline monitoring program is to collect background monitoring data to identify baseline conditions in at least the first 12 months "pre-construction", prior to commencement of construction of the M12 Motorway.

The baseline data would support the development of a groundwater monitoring program and management plans for construction and operation of the project. The baseline data may also inform the design of construction and operational groundwater quality controls.

Step 3: Identify the information inputs

The following inputs are required for the decision:

Existing data obtained from previous Jacobs reports: Surface water and hydrology assessment report (JAJV, 2018a), Contamination factual report (JAJV, 2018b) and groundwater assessment report (2018c).

- Sampling and gauging of four groundwater well locations (BH104/BH104R, BH107/BH107R, BH112/BH112R and BH145/BH145R) along the proposed project alignment.
- Analysis of groundwater samples for the following analytes:
 - Dissolved heavy metals (arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel and zinc)
 - Total recoverable hydrocarbons (TRH)
 - Benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN)
 - Nutrients (including ammonia, nitrate, nitrite, total nitrogen, total phosphorus)
 - Total dissolved solids (TDS)
 - Total suspended solids (TSS)
 - Major anions and cations (chloride, sulfate, sodium, potassium, magnesium, calcium, carbonate and bicarbonate)

- Total hardness as CaCO₃.
- PAHs and phenols (two rounds in pre-construction, construction and post construction stage).
- Comparison of data with relevant public health and environmental water quality criteria to identify baseline conditions prior to commencement of the construction of the project.
- Confirmation that data generated by sampling and analysis are of a suitable quality to allow reliable comparison to baseline data as per the assessment of the data quality indicators (DQIs) (further discussed below).
- Baseline 20th and/or 80th percentiles to be calculated and compared to the construction monitoring period to ensure that the construction of the motorway is not impacted on the groundwater.

Step 4: Define the boundaries of the study

The spatial and temporal boundaries of the study area are as follows:

- The lateral boundary of the project is defined as the extent of the groundwater monitoring locations as shown in Figure 1, Appendix A.
- The vertical boundary of the project is defined as the depth of the maximum groundwater well, approximately 72.15m AHD (BH112)
- The temporal boundary of the project is defined as the previous baseline monitoring periods (April 2019 to July 2022) and the construction monitoring period (August 2022 to March 2024).

Step 5: Develop the analytical approach

The degree of impact by contaminants and the associated decisions will be assessed with reference to assessment criteria, as discussed in Section 4.2. Acceptable relative percentage difference (RPD) limits for chemicals of potential concern (CoPC) detected in Quality Assurance and Quality Control (QA/QC) samples such as field duplicates, rinsate blanks, trip blanks and trip spikes and matrix spikes and matrix spike duplicates are identified in the following sections. The decision rules to be applied are as follows:

- Monitoring data will be compared against relevant public health and environmental water quality guidelines to make this assessment.
- If the data has been collected in a manner from which it is possible to establish completeness, comparability, representativeness, precision and accuracy, the data will be considered suitable for the purposes of this assessment.
- If baseline data, either within or exceeding adopted assessment criteria, is considered suitable for interpretation, baseline conditions are able to be determined and support the development of a groundwater monitoring program during the construction and future operation of the project.
- If changes in groundwater conditions are observed between monitoring events during the construction and/or operational phases and previous baseline periods that cannot be plausibly explained by natural environmental fluctuations, and the concentrations of contaminants of potential concern have become elevated to levels in exceedance of the adopted public health and environmental water quality criteria, then further assessment may be required to evaluate the need for additional investigation and / or remediation / management activities.

Step 6: Specify performance or acceptance criteria

Data generated during this groundwater monitoring program must be appropriate to allow decisions to be made with confidence. Specific limits have been adopted in accordance with the appropriate guidance from the AS4482.1, which includes appropriate indicators of data quality (DQIs used to assess QA/QC, and GHD's Standard Field Operating Procedures). The pre-determined DQIs established for the project are discussed below.

If any of the DQIs are not met, further investigation will be necessary to determine whether the non-conformance will significantly affect the usefulness of the data.

Step 7: Develop the plan for obtaining data

This step involves identifying the most resource effective sampling and analysis design which is required to satisfy the DQOs. The sampling and analysis plan which was developed to meet this objective is provided in Section 3.

Data quality indicators

Data generated during this investigation must be appropriate to allow decisions to be made with confidence. Specific limits for this investigation have been adopted in accordance with guidance from the AS4482.1 which includes appropriate indicators of data quality ((DQIs) used to assess QA/QC, and GHD's Standard Field Operating Procedures).

To assess the usability of the data prior to making decisions, the data was assessed against pre-determined DQIs. The DQIs including precision, accuracy, representativeness, comparability and completeness, were reviewed at the completion of the investigation works to assess for the presence of decision errors.

The pre-determined DQIs established for the investigation are discussed below and shown in Table F1.

- Precision - measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the RPD of duplicate samples.
- Accuracy - measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this investigation is a measure of the closeness of the analytical results obtained by a method to the 'true' (or standard) value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards.
- Representativeness - expresses the degree to which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the site, and by using an adequate number of sample locations to characterise the site to the required accuracy.
- Comparability - expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples; ensuring analysing laboratories use consistent analysis techniques and reporting methods.
- Completeness - is defined as the percentage of measurements made which are judged to be valid measurements.

Table F1 – Summary of quality assurance / quality control criteria – all media

Data quality indicator	Frequency	Data quality acceptance criteria
Precision		
Blind and split duplicates	1 / 10 samples (combined)	<30-50% RPD
Transport spike	1 per batch	70-130% recovery
Transport blank	1 per batch	<LOR
Accuracy		
Surrogate spikes	All organic samples	70-130%
Laboratory control samples	1 per lab batch	<LOR
Matrix spikes	1 per lab batch	70-130%
Rinsate blanks (for non-dedicated equipment)	1 per lab event	<LOR
Representativeness		
Sampling appropriate for media and analytes	All samples	-
Samples extracted and analysed within holding times	All samples	Organics (14 days) Inorganics (6 months)
Comparability		
Consistent field conditions, sampling staff and laboratory analysis	All samples	All samples
Standard operating procedures for sample collection & handling	All samples	All samples
Standard analytical methods used for all analyses	All samples	All samples

Data quality indicator	Frequency	Data quality acceptance criteria
Completeness		
Sample description and COCs completed and appropriate	All Samples	All Samples
Appropriate documentation	All Samples	All Samples
Satisfactory frequency and result for QA/QC samples	All QA/QC samples	-
Data from critical samples is considered valid	-	Critical samples valid

If any of the DQIs are not met, further investigation will be necessary to determine whether the non-conformance will significantly affect the usefulness of the data.

Field QA/QC

An evaluation of the field and laboratory data quality was undertaken in accordance with the NEPM – Schedule B2, Assessment of data quality.

Each monitoring round, one blind duplicate and one split duplicate was collected from two different sampling locations where possible and analysed as part of the project quality control program. Blind duplicate samples were analysed as an intra-laboratory duplicate at the primary laboratory (ALS Environmental). Split duplicates were analysed as inter-laboratory duplicates at the secondary laboratory (Eurofins). The duplicate samples and trip blanks are used by GHD to assess reliability of analytical results, with one of each generally collected during each monitoring event.

Six intra-laboratory duplicate samples were collected during the current monitoring period and include the following:

- GWDUP1/BH112R – 6 October 2023
- GWDUP1/BH112R – 8 November 2023
- GWDUP1/BH145R – 5 December 2023
- GWDUP1/BH145R – 19 January 2024
- GWDUP1/BH112R – 13 February 2024
- GWDUP1/BH145R – 14 March 2024

Six inter-laboratory duplicate samples were collected during the current monitoring period and include the following:

- GWDUP2/BH107R – 6 October 2023
- GWDUP2/BH107R – 8 November 2023
- GWDUP2/BH107R – 6 December 2023
- GWDUP2/BH104R – 19 January 2024
- GWDUP2/BH107R – 13 February 2024
- GWDUP2/BH104R – 15 March 2024

Twenty-four primary samples were collected during the October 2023 to March 2024 monitoring period. It was considered that the number of duplicates collected was adequate (12/24 samples = 50%). Trip blank and trip spike samples were collected during all monitoring rounds.

Relative percentage difference calculations

Relative percentage difference (RPD) calculations are used to assess how closely primary and inter/intra duplicate sample results match. RPDs are a quantitative measure of the accuracy of the analytical results and are calculated in accordance with the procedure described in AS 4482.1 – 2005 (*Standards Australia 2005*). According to AS 4482.1 – 2005, typical RPDs are expected to range between 30% and 50%; however, this may be higher for organics and for low concentrations of analytes. GHD has adopted the following:

- 200% for concentrations within 1 to 10 times the analyte LOR
- 50% for concentrations within 10 to 30 times the analyte LOR
- 30% for concentrations greater than 30 times the analyte LOR

Where a result is below the laboratory LOR for one of the paired samples, the concentration assigned to that sample is the LOR. Where both results are reported below laboratory LOR the RPD is not calculated.

There were no RPD exceedances reported for M12 groundwater sampling during the current monitoring period:

RPD results are presented in Table F2, Appendix F.

Trip blanks

Trip blank samples provide an indication of cross contamination from volatile substances during field sampling and / or during transport. Trip blanks were collected and analysed at a rate of one per sample batch submitted to the laboratory.

The six trip blank samples were free of contaminants, reporting concentrations below the laboratory detection limits.

Trip blank results are provided in Table F3, Appendix F.

Rinsate blank

Rinsate blank samples were free of contaminants, reporting concentrations below laboratory detection limits, with exception of one detection in January 2024 of chromium (III+VI) at a concentration of 0.003 mg/L. There were no detections for chromium (III+VI) during this monitoring event and therefore this detection is not considered to affect the usability of the analytical results.

Rinsate results are provided in Table F3, Appendix F.

Trip spike samples

Trip spike samples are samples prepared by the primary laboratory and “spiked” with a known concentration of volatile compound (BTEXN) to provide an indication of variation in volatile parameters concentrations during transport and handling. Trip spikes were collected and analysed at a rate of one per sample batch submitted to the laboratory. Acceptance criteria for trip spike recovery is between 70 – 130%.

Trip spike samples were prepared, transported with samples, and analysed for BTEX for the six monitoring events. The trip spike recovery results are provided in Table F3, Appendix F.

The recovery of BTEXN were within the acceptable range of 70 to 130%.

Laboratory QA/QC

The NATA certified laboratories utilised for this assessment (ALS Environmental and Eurofins) undertook their own quality assurance and quality control procedures for sample analysis. GHD has reviewed the internal laboratory control data provided within the laboratory reports (refer to Appendix H). It is noted comments have been provided by the laboratory where a failure result was reported in laboratory QA/QC procedures.

Laboratory holding time

Samples were extracted within the required holding time for chemical analysis as presented on laboratory reports in Appendix H. Concentrations of analytes reporting holding time were generally consistent across the current monitoring period with the exception of the following:

- March 2024 event, BH145R was overdue by 1 day for nitrate and phosphorus.

Due to a short holding time of 2 days, nitrate and phosphorus samples were overdue. This delay is not expected to affect the usability of results due to the short delay period.

Matrix spikes

All matrix spike recovery results were reported within the laboratory limits (70% - 130%), with the exception of the following:

- December 2023 event for mercury, where the recovery was less than the lower data quality objective.

It should be noted there were additional outliers as some matrix spike recoveries were unable to be determined. This was because the background level was greater than or equal to four times the spike level. This occurred in the following events:

- October 2023 event for sulfate and chloride.
- November 2023 event for sulfate, nitrate and nitrite.
- December 2023 event for sulfate.

As all reported matrix recoveries were within laboratory limits during the monitoring period, or reported in anonymous samples, the matrix spike outliers are not considered to have any impact on the outcome of the investigation, or interpretation of this round of data.

Laboratory control samples, surrogate spikes

All laboratory control samples (LCS) and surrogate spike recoveries were within laboratory limits (70%-130% for LCS and 50%-150% for surrogate recoveries).

Laboratory duplicate samples

All laboratory duplicate samples were reported within the laboratory limits (30%), with the exception of the following:

- November 2023 event for copper.

Frequency of quality control samples

A sufficient frequency of quality control samples was reported by the laboratory during the monitoring period with the exception of the following:

- October 2023 and February 2024 events for TRH. Laboratory duplicate and matrix spike actual rate – 0%, expected rate – 5-10%.
- January 2024 event for PAH, phenols and TRH. Laboratory duplicate and matrix spike actual rate – 0%, expected rate – 5-10%.

As quality control samples were collected for the remainder of analytes and samples during the monitoring period, it is considered that any reduced rate of collection of laboratory duplicate and matrix spikes did not have a material impact on the outcome of the investigation, or interpretation of this round of data.

QA/QC assessment outcome

The review of the QA/QC program and data indicates that the groundwater analytical data are of an acceptable quality upon which to draw meaningful conclusions regarding impacts to groundwater at the site.



Appendix F
Table F2
Calculated Relative Percentage Difference (RPD) in Field Duplicate Samples

Transport for NSW
M12 Motorway
Groundwater Monitoring Program

Location Code Date Field ID Matrix Type Sample Type Lab Report Number	BH112R		RPD	BH107R		RPD	BH112R		RPD	BH107R		RPD	BH145R		RPD	BH107R		RPD
	06 Oct 2023			06 Oct 2023			08 Nov 2023			08 Nov 2023			05 Dec 2023			06 Dec 2023		
	BH112R	GWDUP1		BH107R	GWDUP2		BH112R	GWDUP1		BH107R	GWDUP2		BH145R	GWDUP1		BH107R	GWDUP2	
	Water	Water		Water	Water		Water	Water		Water	Water		Water	Water		Water	Water	
	Normal	Field_D		Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D	
	ES2334429	ES2334429		ES2334429	1033274		ES2338893-AF	ES2338893-AF		ES2338893-AF	1043528		ES2342531	ES2342531		ES2342531	1052387	

Chemistry Name	Unit	EQL																		
Metals																				
Arsenic (filtered)	mg/L	0.001	0.011	0.010	10	<0.001	<0.001	0	0.008	0.008	0	<0.001	<0.001	0	<0.001	0.001	0	<0.001	<0.001	0
Cadmium (filtered)	mg/L	0.0001	<0.0001	<0.0001	0	<0.0001	<0.0002	0	<0.0001	<0.0001	0	<0.0001	<0.0002	0	<0.0001	<0.0001	0	<0.0001	<0.0002	0
Chromium (III+VI) (filtered)	mg/L	0.001	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	0.002	67	<0.001	<0.001	0
Copper (filtered)	mg/L	0.001	0.016	0.014	13	0.004	0.003	29	0.006	0.008	29	0.007	0.005	33	<0.001	<0.001	0	<0.001	0.002	67
Lead (filtered)	mg/L	0.001	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0
Mercury (filtered)	mg/L	0.0001	<0.0001	<0.0001	0	<0.0001	<0.0001	0	<0.0001	<0.0001	0	<0.0001	<0.0001	0	<0.0001	<0.0001	0	<0.0001	<0.0001	0
Nickel (filtered)	mg/L	0.001	0.016	0.016	0	0.006	0.006	0	0.009	0.009	0	0.005	0.004	22	<0.001	<0.001	0	0.002	0.002	0
Zinc (filtered)	mg/L	0.005	0.048	0.046	4	0.018	0.014	25	0.012	0.017	34	0.018	0.012	40	<0.005	<0.005	0	0.007	0.007	0

Location Code Date Field ID Matrix Type Sample Type Lab Report Number	BH145R		RPD	BH104R		RPD	BH112R		RPD	BH107R		RPD	BH145R		RPD	BH104R		RPD
	19 Jan 2024			19 Jan 2024			13 Feb 2024			13 Feb 2024			14 Mar 2024			15 Mar 2024		
	BH145R	GWDUP1		BH104R	GWDUP2		BH112R	GWDUP1		BH107R	GWDUP2		BH145R	GWDUP1		BH104R	GWDUP2	
	Water	Water		Water	Water		Water	Water		Water	Water		Water	Water		Water	Water	
	Normal	Field_D		Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D	
	ES2401985	ES2401985		ES2401985	1061811		ES2404914	ES2404914		ES2404914	1069861		ES2408629	ES2408629		ES2408629	1079293	

Chemistry Name	Unit	EQL																		
Metals																				
Arsenic (filtered)	mg/L	0.001	0.002	0.002	0	0.003	0.003	0	0.004	0.004	0	<0.001	<0.001	0	0.003	0.003	0	0.004	0.004	0
Cadmium (filtered)	mg/L	0.0001	<0.0001	<0.0001	0	<0.0001	<0.0002	0	<0.0001	<0.0001	0	<0.0001	<0.0002	0	<0.0001	<0.0001	0	<0.0001	<0.0002	0
Chromium (III+VI) (filtered)	mg/L	0.001	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0
Copper (filtered)	mg/L	0.001	<0.001	<0.001	0	<0.001	<0.001	0	0.006	0.006	0	0.001	0.002	67	<0.001	<0.001	0	<0.001	<0.001	0
Lead (filtered)	mg/L	0.001	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0
Mercury (filtered)	mg/L	0.0001	<0.0001	<0.0001	0	<0.0001	<0.0001	0	<0.0001	<0.0001	0	<0.0001	<0.0001	0	<0.0001	<0.0001	0	<0.0001	<0.0001	0
Nickel (filtered)	mg/L	0.001	0.001	0.001	0	<0.001	<0.001	0	0.007	0.007	0	0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0
Zinc (filtered)	mg/L	0.005	<0.005	<0.005	0	<0.005	<0.005	0	0.014	0.013	7	0.010	<0.005	67	<0.005	<0.005	0	<0.005	<0.005	0

*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 200 (1 - 10 x EQL); 50 (10 - 30 x EQL); 30 (> 30 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory



Appendix F
Table F3
Trip Blank, Rinsate Blank and Trip Spike Results

Transport for NSW
M12 Motorway
Groundwater Monitoring Program

Sample Type	Trip_B						Rinsate						Trip_S						
	Date	03 Oct 2023	08 Nov 2023	30 Nov 2023	15 Jan 2024	05 Feb 2024	11 Mar 2024	06 Oct 2023	08 Nov 2023	06 Dec 2023	19 Jan 2024	13 Feb 2024	15 Mar 2024	03 Oct 2023	08 Nov 2023	30 Nov 2023	15 Jan 2024	05 Feb 2024	11 Mar 2024
	Field ID	Trip Blank	TRIP BLANK	Trip blank	Trip Blank	Trip Blank	Trip Blank	GWRB1	GWRB1	GWRB1	GWRB1	GWRB1	GWRB1	Trip Spike	TRIP SPIKE	Trip spike	Trip Spike	Trip Spike	Trip Spike
Lab Report Number	ES2334429	ES2338893-AF	ES2342531	ES2401985	ES2404914	ES2408629	ES2334429	ES2338893-AF	ES2342531	ES2401985	ES2404914	ES2408629	ES2334429	ES2338893-AF	ES2342531	ES2401985	ES2404914	ES2408629	

Chem Name	Unit	EQL																	
Metals																			
Arsenic	mg/L	0.001	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-
Cadmium	mg/L	0.0001	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-
Chromium (III+VI)	mg/L	0.001	-	-	-	-	-	-	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	-	-	-	-	-
Copper	mg/L	0.001	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-
Lead	mg/L	0.001	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-
Mercury	mg/L	0.0001	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-
Nickel	mg/L	0.001	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-
Zinc	mg/L	0.005	-	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
BTEXN																			
Benzene	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-
	%														105	90	70	85	80
Toluene	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
	%														90	80	75	85	85
Ethylbenzene	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
	%														85	80	75	85	85
Xylene (o)	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
	%														90	90	85	95	95
Xylene (m & p)	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
	%														85	85	75	90	90
Xylene Total	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
	%														87.5	87.5	80	92.5	92.5
Naphthalene (BTEXN suite)	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-	-	-
	%														100	105	85	95	90
TRH - NEPM 2013																			
F1 (C6-C10 minus BTEX)	mg/L	0.02	<0.02	-	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-
C6-C10 Fraction	mg/L	0.02	<0.02	-	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-
TRH - NEPM 1999																			
C6-C9 Fraction	mg/L	0.02	<0.02	-	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-

*Trip blank and rinsate blank concentrations greater than the LOR have been highlighted.
** Acceptable trip spike recoveries are in the range of 70 to 130 %

Appendix G

Field sheets



Purging and Sampling Record

Bore ID: BH104R

Job Information		Sampling Information		Bore Information			
Client: Transport for NSW		Purge Method:	Low flow	SWL(mbTOC):	11.790 m	Logic Check:	Yes
Project: M12 Motorway		Sample Method:	Micropurge	Screen: From	to		m
Proj. No.: 12554717		WQ Meter Type:	YSI	NAPL Check:	not present	Stick Up:	m
Sampler: E. Smith / T. Nham		Flow Cell: Yes	Pump Depth: 17 m	Ref.datum:	TOC	Bore Diam.:	50 mm
Date: 6/10/2023		WLevel Meter Type:	Int.Fce	Bore Depth:	18.150 m	Well Cap Secure?	Yes
Round October 2023		Field Filtered?	Yes (disposable filter)				

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
10:45	1.0	19.4	6.64	7823	0.50	52.8	11.810	Pale brown tinge, mostly clear, no odour or sheen.
10:48	2.0	19.4	6.66	7797	0.40	34.0	12.150	
10:51	3.0	19.4	6.64	7764	0.20	13.1	12.280	
10:54	4.0	19.4	6.63	7755	0.10	-3.7	12.330	Pale brown tinge, mostly clear, no odour or sheen.
10:57	5.0	19.4	6.64	7756	0.10	-16.0	12.380	
11:00	6.0	19.4	6.66	7719	0.10	-29.8	12.430	Pale brown tinge, mostly clear, no odour or sheen.
11:03	7.0	19.4	6.66	7707	0.00	-33.5	12.480	Parameters stable, samples collected.

Field QA Checks:		Analyte	Collected	Analyte	Collected		
Air bubbles in vials or violent reactions?	No	Non-filtered inorganics	Yes	VOCs	Yes	Duplicate collected?	No
Decontamination as per GHD procedure?	Yes	Preserved inorganics	Yes	TRH	Yes		
Was sampling equipment pre-cleaned?	Yes	Semi-VOCs	Yes	PFAS	Yes	# Bottles collected	6
COC updated?	Yes	Dissolved metals	Yes	Total metals	Yes		

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc				Purge Volumes		
				Casing Int. Dia (mm)	50	100 150
				Vol (L/m of casing)	2.0	7.9 17.7



Purging and Sampling Record

Bore ID: BH107R

Job Information		Sampling Information		Bore Information			
Client: Transport for NSW		Purge Method:	Low flow	SWL(mbTOC):	7.698 m	Logic Check:	Yes
Project: M12 Motorway		Sample Method:	Micropurge	Screen: From	to		m
Proj. No.: 12554717		WQ Meter Type:	YSI	NAPL Check:	not present	Stick Up:	m
Sampler: E. Smith / T. Nham		Flow Cell: Yes	Pump Depth: 12 m	Ref.datum:	TOC	Bore Diam.:	50 mm
Date: 6/10/2023		WLevel Meter Type:	Int.Fce	Bore Depth:	14.610 m	Well Cap Secure?	Yes
Round October 2023		Field Filtered?	Yes (disposable filter)				

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
9:14	1.0	18.8	7.30	3154	9.00	99.8	8.275	Pale brown tinge, slightly turbid, no odour or sheen.
9:18	2.0	18.8	7.30	3145	9.20	103.0	8.500	
9:21	3.0	18.8	7.31	3127	9.30	104.0	8.910	
9:26	4.0	18.8	7.30	3131	9.40	102.4	9.170	Pale brown tinge, slightly turbid, no odour or sheen.
9:30	5.0	18.8	7.31	3117	9.90	107.0	9.430	
9:34	6.0	18.9	7.31	3112	9.90	107.5	9.760	Pale brown tinge, slightly turbid, no odour or sheen.
9:38	7.0	18.9	7.31	3110	9.91	108.3	10.180	Parameters stable, samples collected.

Field QA Checks:		Analyte	Collected	Analyte	Collected		
Air bubbles in vials or violent reactions?	No	Non-filtered inorganics	Yes	VOCs	Yes	Duplicate collected?	Yes
Decontamination as per GHD procedure?	Yes	Preserved inorganics	Yes	TRH	Yes		
Was sampling equipment pre-cleaned?	Yes	Semi-VOCs	Yes	PFAS	No	# Bottles collected	7
COC updated?	Yes	Dissolved metals	Yes	Total metals	No		

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc				Purge Volumes		
GWDUP2 collected (EF metals)				Casing Int. Dia (mm)	50	100 150
				Vol (L/m of casing)	2.0	7.9 17.7



Purging and Sampling Record

Bore ID: BH112R

Job Information		Sampling Information		Bore Information			
Client: Transport for NSW		Purge Method:	Low flow	SWL(mbTOC):	12.700 m	Logic Check:	Yes
Project: M12 Motorway		Sample Method:	Micropurge	Screen: From	to		m
Proj. No.: 12554717		WQ Meter Type:	YSI	NAPL Check:	not present	Stick Up:	m
Sampler: E. Smith / T. Nham		Flow Cell: Yes	Pump Depth: 18 m	Ref.datum:	TOC	Bore Diam.:	50 mm
Date: 6/10/2023		WLevel Meter Type:	Int.Fce	Bore Depth:	21.110 m	Well Cap Secure?	Yes
Round October 2023		Field Filtered?	Yes (disposable filter)				

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
8:02	1.0	18.4	6.75	13139	3.50	135.9	12.980	Pale brown tinge, slightly turbid, no odour or sheen.
8:06	2.0	18.6	6.79	13128	5.30	132.1	13.200	
8:10	3.0	18.7	6.80	13108	6.30	128.1	13.400	Pale brown tinge, slightly turbid, no odour or sheen.
8:14	4.0	18.7	6.87	13082	7.10	109.3	13.660	
8:18	5.0	18.7	6.86	13073	6.86	116.7	13.820	Pale brown tinge, slightly turbid, no odour or sheen.
8:22	6.0	18.8	6.87	13114	6.88	119.4	13.970	
8:26	7.0	18.8	6.89	13124	6.89	119.9	14.160	Parameters stable, samples collected.

Field QA Checks:		Analyte	Collected	Analyte	Collected		
Air bubbles in vials or violent reactions?	No	Non-filtered inorganics	Yes	VOCs	Yes	Duplicate collected?	Yes
Decontamination as per GHD procedure?	Yes	Preserved inorganics	Yes	TRH	Yes		
Was sampling equipment pre-cleaned?	Yes	Semi-VOCs	Yes	PFAS	No	# Bottles collected	7
COC updated?	Yes	Dissolved metals	Yes	Total metals	No		

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc		Purge Volumes		
GWDUP1 collected (ALS metals)		Casing Int. Dia (mm)	50	100 150
		Vol (L/m of casing)	2.0	7.9 17.7



Purging and Sampling Record

Bore ID: BH145R

Job Information		Sampling Information		Bore Information			
Client: Transport for NSW		Purge Method:	Low flow	SWL(mbTOC):	11.760 m	Logic Check:	Yes
Project: M12 Motorway		Sample Method:	Micropurge	Screen: From	to		m
Proj. No.: 12554717		WQ Meter Type:	YSI	NAPL Check:	not present	Stick Up:	m
Sampler: E. Smith / T. Nham		Flow Cell:	Pump Depth:	Ref.datum:	TOC	Bore Diam.:	50 mm
Date: 6/10/2023		WLevel Meter Type:	Int.Fce	Bore Depth:	19.980 m	Well Cap Secure?	Yes
Round October 2023		Field Filtered?	Yes (disposable filter)				

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
14:39	1.0	18.8	6.69	14016	0.70	-82.8	11.800	Pale brown tinge, mostly clear, no odour or sheen.
14:43	2.0	18.5	6.64	14041	0.30	-89.4	11.810	Great recharge.
14:47	3.0	19.2	6.65	14216	0.30	-92.3	11.820	Clear, no odour or sheen.
14:51	4.0	19.1	6.65	14208	0.20	-97.0	11.830	
14:56	5.0	18.7	6.65	14063	0.10	-93.2	11.840	Clear, no odour or sheen.
15:00	6.0	18.6	6.65	13985	0.10	-93.1	11.850	
15:04	7.0	19.3	6.65	14187	0.10	-92.8	11.860	Parameters stable, samples collected.

Field QA Checks:		Analyte	Collected	Analyte	Collected		
Air bubbles in vials or violent reactions?	No	Non-filtered inorganics	Yes	VOCs	Yes	Duplicate collected?	Yes
Decontamination as per GHD procedure?	Yes	Preserved inorganics	Yes	TRH	Yes		
Was sampling equipment pre-cleaned?	Yes	Semi-VOCs	Yes	PFAS	No	# Bottles collected	6
COC updated?	Yes	Dissolved metals	Yes	Total metals	No		

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc				Purge Volumes		
				Casing Int. Dia (mm)	50	100 150
				Vol (L/m of casing)	2.0	7.9 17.7



Groundwater Gauging Record

Client: TfNSW
Project: M12 Motorway
Job No.: 12554717
Location: Western Sydney, Sydney, NSW

WL Meter Type: Int.Fce
Date: 04-10-23 to 05-10-23
Time:
Sampler: E. Smith / T. Nham

Well ID	Date	Accessible?	SWL (mbTOC)	BOC (mbTOC)	Data logger present?	Data logger brand type	Data logger downloaded?	Comment
WSP_BH06	4/10/2023	Yes	7.430	10.820	No	-	No	A monitoring well adjacent to the sealed local road from Clifton Ave, near the M12 site. Have not previously travelled down this road.
BH104R*	6/10/2023	Yes	11.790	18.150	Yes	Solinst	Yes	
BH107R*	6/10/2023	Yes	7.698	14.610	Yes	HOB0	Yes	
BH112R*	6/10/2023	Yes	12.700	21.110	Yes	Solinst	Yes	
BH145R	6/10/2023	Yes	11.760	19.980	Yes	HOB0	Yes	
BH155	4/10/2023	Yes	DRY	-	-	-	-	
BH162	4/10/2023	Yes	6.075	18.200	Yes	HOB0	Yes	
BH170	4/10/2023	Not located to date	-	-	-	-	-	
BH175	4/10/2023	Yes	4.631	17.940	Yes	Solinst	Yes	
BH219	4/10/2023	Yes	0.495	18.280	Yes	HOB0	Yes	

* BH104, BH107 and BH112 destroyed November 2022 and replacement wells BH104R, BH107R and BH112R are now in use.

* BH145 is no longer in use as of April 2023 and replacement well BH145R is available for sampling.

Purging and Sampling Record

Bore ID: BH104R

Job Information Client: Transport for NSW Project: M12 Motorway Proj. No.: 12554717 Sampler: E. Smith / A. Duval Date: 8/11/2023 Round November 2023		Sampling Information Purge Method: Low flow Sample Method: Micropurge WQ Meter Type: YSI Flow Cell: Yes Pump Depth: 13 m WLevel Meter Type: Interface Probe Field Filtered? Yes (disposable filter)		Bore Information SWL(mbTOC): 11.620 m Screen: From Absent to NAPL Check: Stick Up: m Ref.datum: TOC Bore Diam.: 50 mm Bore Depth: 18.140 m Well Cap Secure? Yes	

[illegible]

Field QA Checks:	Air bubbles in vials or violent reactions?	No	Decontamination as per GHD procedure?	Yes	Was sampling equipment pre-cleaned?	Yes	COC updated?	Yes	
	Container Collected	Green 500 mL Plastic	Yes	Red 60 mL Plastic	Yes	Purple 2x40 mL Vials	Yes	# Bottles collected	6
	Container Collected	Orange 100 mL Glass	Yes	Duplicate collected?	No	Metals Filtered?	Yes		

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

<i>Purge Volumes</i>			
Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

Monument has clearly been backed into by accident, concrete surrounding monument is cracked but monument and well itself not visibly damaged



Purging and Sampling Record

Bore ID: BH112R

Job Information		Sampling Information		Bore Information	
Client: Transport for NSW		Purge Method: Low flow		SWL(mbTOC): 12.905 m	Logic Check: Yes
Project: M12 Motorway		Sample Method: Micropurge		Screen: From to m	
Proj. No.: 12554717		WQ Meter Type: YSI		NAPL Check: Absent	Stick Up: m
Sampler: E. Smith / A. Duval		Flow Cell: Yes	Pump Depth: 16 m	Ref.datum: TOC	Bore Diam.: 50 mm
Date: 8/11/2023		WLevel Meter Type: Interface Probe		Bore Depth: 21.100 m	Well Cap Secure? Yes
Round November 2023		Field Filtered? Yes (disposable filter)			

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
8:30	1.0	19.5	6.67	14022	0.40	99.8	13.395	Mostly clear, slightly cloudy, no odour, no sheen, no sediment
8:33	2.0	19.5	6.66	15765	0.20	88.6	13.570	
8:36	3.0	19.5	6.66	15804	0.13	82.4	13.795	
8:39	4.0	19.3	6.66	15810	0.09	77.5	13.990	
8:42	5.0	19.4	6.66	15855	0.07	72.0	14.180	
8:45	6.0	19.4	6.66	15882	0.07	67.4	14.370	
8:48	7.0	19.5	6.66	15921	0.09	61.5	14.650	
8:51	8.0	19.4	6.66	15954	0.08	58.3	14.840	Parameters stable samples collected

Field QA Checks:		Container	Collected	Container	Collected	
Air bubbles in vials or violent reactions?	No	Green 500 mL Plastic	Yes	Red 60 mL Plastic	Yes	Duplicate collected? Yes
Decontamination as per GHD procedure?	Yes	Orange 100 mL Glass	Yes	Purple 2x40 mL Vials	Yes	Metals Filtered? Yes
Was sampling equipment pre-cleaned?	Yes	Purple 60 mL Plastic	Yes			
COC updated?	Yes					# Bottles collected 7

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc GWDUP1 ALS Metals	Purge Volumes		
	Casing Int. Dia (mm)	50	100 150
	Vol (L/m of casing)	2.0	7.9 17.7



Purging and Sampling Record

Bore ID: BH145R

Job Information		Sampling Information		Bore Information	
Client: Transport for NSW	Purge Method: Low flow	SWL(mbTOC): 11.650 m	Logic Check: Yes		
Project: M12 Motorway	Sample Method: Micropurge	Screen: From to m			
Proj. No.: 12554717	WQ Meter Type: YSI	NAPL Check: Absent	Stick Up: 0 m		
Sampler: E. Smith / A. Duval	Flow Cell: Yes	Pump Depth: 14.3 m	Ref.datum: TOC		
Date: 9/11/2023	WLevel Meter Type: Interface Probe	Bore Depth: 19.970 m	Bore Diam.: 50 mm		
Round November 2023	Field Filtered? Yes (disposable filter)	Well Cap Secure? Yes			

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
12:02	1.0	19.3	6.57	17653	0.15	-73.2	11.680	Clear, no odour, no sheen, no sediment
12:04	2.0	19.2	6.57	17692	0.10	-76.6	11.710	Good recharge
12:06	3.0	19.7	6.57	17749	0.09	-80.9	11.710	
12:08	4.0	19.7	6.57	17874	0.07	-82.0	11.710	
12:10	5.0	19.7	6.57	17972	0.05	-82.9	11.720	
12:12	6.0	19.7	6.58	18003	0.03	-83.3	11.720	
12:14	7.0	19.7	6.58	18021	0.02	-84.0	11.720	Parameters stable, samples collected

Field QA Checks:		Container	Collected	Container	Collected	Duplicate collected?	
Air bubbles in vials or violent reactions?	No	Green 500 mL Plastic	Yes	Red 60 mL Plastic	Yes	Duplicate collected?	No
Decontamination as per GHD procedure?	Yes	Orange 100 mL Glass	Yes	Purple 2x40 mL Vials	Yes	Metals Filtered?	Yes
Was sampling equipment pre-cleaned?	Yes	Purple 60 mL Plastic	Yes				
COC updated?	Yes					# Bottles collected	6

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc	Purge Volumes		
	Casing Int. Dia (mm)	50	100 150
	Vol (L/m of casing)	2.0	7.9 17.7



Purging and Sampling Record

Bore ID: BH104R

Job Information		Sampling Information		Bore Information	
Client: Transport for NSW		Purge Method: Low flow		SWL(mbTOC): 11.465 m	Logic Check: Yes
Project: M12 Motorway		Sample Method: Micropurge		Screen: From to m	
Proj. No.: 12554717		WQ Meter Type: YSI		NAPL Check: Absent	Stick Up: m
Sampler: E. Smith / A. Duval		Flow Cell: Yes	Pump Depth: 15 m	Ref.datum: TOC	Bore Diam.: 50 mm
Date: 6/12/2023		WLevel Meter Type: Interface Probe		Bore Depth: 18.140 m	Well Cap Secure? Yes
Round December 2023		Field Filtered? Yes (disposable filter)			

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
10:06	1.0	20.5	7.70	8770	0.63	32.6	11.750	Clear, no odour, no sheen, no sediment
10:09	2.0	20.3	6.72	8712	0.43	35.0	11.935	
10:12	3.0	20.2	6.71	8681	0.30	25.8	12.060	
10:15	4.0	20.3	6.71	8678	0.24	11.4	12.165	Increased fill time
10:20	5.0	20.8	6.71	8755	0.21	-8.9	12.160	Great recharge
10:25	6.0	21.0	6.73	8759	0.21	-27.2	12.170	
10:30	7.0	20.9	6.75	8672	0.16	-49.7	12.175	
10:35	8.0	21.0	6.76	8612	0.13	-68.0	12.160	
10:40	9.0	21.0	6.77	8614	0.11	-83.3	12.140	
10:45	10.0	21.1	6.77	8619	0.10	-92.4	12.170	
10:50	11.0	21.1	6.78	8611	0.08	-97.9	12.170	Parameters stable, samples collected.

Field QA Checks:		Container	Collected	Container	Collected		
Air bubbles in vials or violent reactions?	No	Green 500 mL Plastic	1	Red 60 mL Plastic	1	Duplicate collected?	No
Decontamination as per GHD procedure?	Yes	Orange 100 mL Glass	1	Purple 2x40 mL Vials	1	Metals Filtered?	Yes
Was sampling equipment pre-cleaned?	Yes	Purple 60 mL Plastic	1				
COC updated?	Yes					# Bottles collected	6

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc				Purge Volumes		
				Casing Int. Dia (mm)	50	100 150
				Vol (L/m of casing)	2.0	7.9 17.7



Purging and Sampling Record

Bore ID: BH107R

Job Information		Sampling Information		Bore Information	
Client: Transport for NSW		Purge Method: Low flow		SWL(mbTOC): 7.810 m	Logic Check:
Project: M12 Motorway		Sample Method: Micropurge		Screen: From to m	
Proj. No.: 12554717		WQ Meter Type: YSI		NAPL Check: Absent	Stick Up: m
Sampler: E. Smith / A. Duval		Flow Cell: Yes	Pump Depth: 12 m	Ref.datum: TOC	Bore Diam.: 50 mm
Date: 6/12/2023		WLevel Meter Type: Interface Probe		Bore Depth: 14.505 m	Well Cap Secure? Yes
Round December 2023		Field Filtered? Yes (disposable filter)			

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
8:43	0.6	20.8	7.11	3790	2.12	100.9	8.115	Clear, no odour, no sheen, no sediment
8:46	1.2	19.8	7.05	3672	0.72	93.6	8.480	
8:49	1.8	19.6	7.06	3605	0.82	69.4	9.000	Poor recharge
8:52	2.4	19.7	7.05	3537	1.34	73.0	9.225	Reduced pump rate
8:55	3.0	20.0	7.06	3520	1.94	75.4	9.370	
8:58	3.6	20.1	7.06	3517	2.08	76.8	9.610	Clear, no odour, no sheen, no sediment
9:01	4.2	20.0	7.06	3502	2.25	78.4	9.850	Still poor to no recharge, reduced pump rate to 1 CPM
9:06	5.0	20.3	7.06	3530	2.35	80.3	10.185	
9:11	5.8	20.4	7.06	3533	2.49	81.8	10.470	
9:16	6.6	20.6	7.06	3495	2.69	84.2	10.820	
9:21	7.4	20.5	7.06	3465	2.71	86.1	11.115	
9:26	8.2	20.6	7.06	3457	2.76	87.5	11.350	Parameters stable, samples collected

Field QA Checks:		Container	Collected	Container	Collected		
Air bubbles in vials or violent reactions?	No	Green 500 mL Plastic	1	Red 60 mL Plastic	2	Duplicate collected?	Yes
Decontamination as per GHD procedure?	Yes	Orange 100 mL Glass	1	Purple 2x40 mL Vials	1	Metals Filtered?	Yes
Was sampling equipment pre-cleaned?	Yes	Purple 60 mL Plastic	1				
COC updated?	Yes					# Bottles collected	7

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc				Purge Volumes		
GWDUP2 Eurofins metals				Casing Int. Dia (mm)	50	100 150
				Vol (L/m of casing)	2.0	7.9 17.7



Purging and Sampling Record

Bore ID: BH112R

Job Information		Sampling Information		Bore Information	
Client: Transport for NSW		Purge Method: Low flow		SWL(mbTOC): 13.020 m	Logic Check:
Project: M12 Motorway		Sample Method: Micropurge		Screen: From to m	
Proj. No.: 12554717		WQ Meter Type: YSI		NAPL Check: Absent	Stick Up: m
Sampler: E. Smith / A. Duval		Flow Cell: Yes	Pump Depth: 18 m	Ref.datum: TOC	Bore Diam.: 50 mm
Date: 6/12/2023		WLevel Meter Type: Interface Probe		Bore Depth: 21.120 m	Well Cap Secure? Yes
Round December 2023		Field Filtered? Yes (disposable filter)			

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
11:46	0.8	21.7	6.72	16130	1.39	77.3	13.300	Clear, no odour, no sheen, no sediment
11:50	1.6	21.5	6.68	15983	0.44	71.0	13.500	
11:54	2.4	21.7	6.67	16027	0.28	69.0	13.650	
11:58	3.2	21.9	6.66	16167	0.27	67.8	13.765	
12:02	4.0	21.7	6.66	16108	0.24	66.8	13.980	
12:06	4.8	21.7	6.66	16060	0.22	66.7	14.085	Clear, no odour, no sheen, no sediment
12:10	5.6	21.8	6.66	16091	0.22	67.2	14.190	
12:14	6.4	21.6	6.66	16082	0.23	67.7	14.305	
12:18	7.2	21.6	6.66	16067	0.24	68.7	14.480	
12:22	8.0	21.9	6.66	16111	0.24	69.5	12.630	Parameters stable, samples collected.

Field QA Checks:		Container	Collected	Container	Collected		
Air bubbles in vials or violent reactions?	No	Green 500 mL Plastic	1	Red 60 mL Plastic	1	Duplicate collected?	No
Decontamination as per GHD procedure?	Yes	Orange 100 mL Glass	1	Purple 2x40 mL Vials	1	Metals Filtered?	Yes
Was sampling equipment pre-cleaned?	Yes	Purple 60 mL Plastic	1				
COC updated?	Yes					# Bottles collected	6

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc				Purge Volumes		
				Casing Int. Dia (mm)	50	100 150
				Vol (L/m of casing)	2.0	7.9 17.7



Purging and Sampling Record

Bore ID: BH145R

Job Information		Sampling Information		Bore Information	
Client: Transport for NSW		Purge Method: Low flow		SWL(mbTOC): 11.525 m	Logic Check: Yes
Project: M12 Motorway		Sample Method: Micropurge		Screen: From to m	
Proj. No.: 12554717		WQ Meter Type: YSI		NAPL Check: Absent	Stick Up: m
Sampler: E. Smith / A. Duval		Flow Cell: Yes	Pump Depth: 16 m	Ref.datum: TOC	Bore Diam.: 50 mm
Date: 5/12/2023		WLevel Meter Type: Interface Probe		Bore Depth: 19.970 m	Well Cap Secure? Yes
Round December 2023		Field Filtered? Yes (disposable filter)			

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
12:06	0.5	20.1	6.62	17079	0.59	-83.1	11.590	Clear, no odour, no sheen, no sediment
12:10	1.0	19.9	6.60	17129	0.36	-85.6	11.595	
12:14	1.5	19.8	6.60	17180	0.25	-87.2	11.600	Gret recharge, flow rate increased
12:18	2.0	19.6	6.59	17140	0.16	-88.9	11.620	
12:21	2.5	19.6	6.61	17036	0.07	-91.4	11.645	
12:24	3.0	19.6	6.60	17042	0.07	-91.6	11.670	
12:27	3.5	19.7	6.60	16989	0.03	-93.6	11.680	
12:30	4.0	19.6	6.60	16963	0.03	-93.8	11.670	Clear, slight sulfuric odour, no sheen, great recharge.
								Parameters stable, samples collected

Field QA Checks:		Container	Collected	Container	Collected		
Air bubbles in vials or violent reactions?	No	Green 500 mL Plastic	1	Red 60 mL Plastic	2	Duplicate collected?	Yes
Decontamination as per GHD procedure?	Yes	Orange 100 mL Glass	1	Purple 2x40 mL Vials	1	Metals Filtered?	Yes
Was sampling equipment pre-cleaned?	Yes	Purple 60 mL Plastic	1				
COC updated?	Yes					# Bottles collected	7

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc				Purge Volumes		
GWDUP1 ALS Metals				Casing Int. Dia (mm)	50	100 150
				Vol (L/m of casing)	2.0	7.9 17.7



Groundwater Gauging Record

Client: TfNSW
Project: M12 Motorway
Job No.: 12554717
Location: Western Sydney, Sydney, NSW

WL Meter Type: Int.Fce
Date: 05-12-2023 to 06-12-2023
Time:
Sampler: E. Smith / A.Duval

Well ID	Date	Accessible?	SWL (mbTOC)	BOC (mbTOC)	Data logger present?	Data logger brand type	Data logger downloaded?	Comment
BH104R*	6/12/2023	Yes	11.465	18.140	Yes	Solinst	Yes	
BH107R*	6/12/2023	Yes	7.810	14.505	Yes	HOB0	Yes	
BH112R*	6/12/2023	Yes	13.020	21.120	Yes	Solinst	Yes	
BH145R*	5/12/2023	Yes	11.525	19.970	Yes	HOB0	Yes	
BH155	5/12/2023	No	-	-	-	-	-	Destroyed.
BH162	5/12/2023	No	-	-	-	-	-	Confirmed destroyed, JH cleared vegetation and access track first
BH170	5/12/2023	Not located to date	-	-	-	-	-	
BH175	5/12/2023	Yes	4.920	17.940	Yes	Solinst	Yes	
BH219	5/12/2023	Yes	0.380	18.280	Yes	HOB0	Yes	

* BH104, BH107 and BH112 destroyed November 2022 and replacement wells BH104R, BH107R and BH112R are now in use.

* BH145 is no longer in use as of April 2023 and replacement well BH145R is available for sampling.



Purging and Sampling Record

Bore ID: BH104R

Job Information		Sampling Information		Bore Information	
Client: Transport for NSW	Purge Method: Low flow	SWL(mbTOC): 11.135 m	Logic Check: Yes		
Project: M12 Motorway	Sample Method: Micropurge	Screen: From to m			
Proj. No.: 12554717	WQ Meter Type: YSI	NAPL Check: Absent	Stick Up: m		
Sampler: E. Smith / A. Duval	Flow Cell: Yes	Pump Depth: 16.5 m	Ref.datum: TOC	Bore Diam.: 50 mm	
Date: 19/01/2024	WLevel Meter Type: Interface Probe	Bore Depth: 18.140 m	Well Cap Secure? Yes		
Round January 2024	Field Filtered? Yes (disposable filter)				

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
8:16	0.8	20.0	6.86	7618	0.71	83.5	11.390	Clear, no odour, no sheen, no sediment
8:21	1.6	20.0	6.86	7624	0.46	79.0	11.505	Flow rate decreased
8:26	2.4	20.1	6.89	7620	0.31	54.4	11.550	
8:31	3.2	20.1	6.90	7588	0.21	17.2	11.620	
8:36	4.0	20.1	6.92	7576	0.18	-0.9	11.660	Good recharge
8:41	4.8	20.1	6.92	7562	0.14	-23.2	11.690	
8:46	5.6	20.2	6.94	7538	0.09	-41.4	11.710	
8:51	6.4	20.2	6.95	7519	0.05	-58.2	11.730	
8:56	7.2	20.2	6.95	7506	0.04	-69.7	11.705	
9:01	8.0	20.2	6.96	7518	0.03	-72.8	11.730	Clear, slight sulphide odour, no sheen, no sediment
								Parameters stable, samples collected

Field QA Checks:		Container	Collected	Container	Collected		
Air bubbles in vials or violent reactions?	No	Green 500 mL Plastic	1	Red 60 mL Plastic	2	Duplicate collected?	Yes
Decontamination as per GHD procedure?	Yes	Orange 100 mL Glass	1	Purple 2x40 mL Vials	1	Metals Filtered?	Yes
Was sampling equipment pre-cleaned?	Yes	Purple 60 mL Plastic	1				
COC updated?	Yes					# Bottles collected	7

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc GWDUP2 Eurofins Metals	Purge Volumes			
	Casing Int. Dia (mm)	50	100	150
	Vol (L/m of casing)	2.0	7.9	17.7



Purging and Sampling Record

Bore ID: BH107R

Job Information		Sampling Information		Bore Information	
Client: Transport for NSW	Purge Method: Low flow	SWL(mbTOC): 7.760 m	Logic Check: Yes		
Project: M12 Motorway	Sample Method: Micropurge	Screen: From to m			
Proj. No.: 12554717	WQ Meter Type: YSI	NAPL Check: Absent	Stick Up: m		
Sampler: E. Smith / A. Duval	Flow Cell: Yes	Pump Depth: 13 m	Ref.datum: TOC		
Date: 19/01/2024	WLevel Meter Type: Interface Probe	Bore Depth: 14.500 m	Bore Diam.: 50 mm		
Round January 2024	Field Filtered? Yes (disposable filter)	Well Cap Secure? Yes			

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
12:37	1.0	20.5	7.16	3426	0.48	95.3	8.110	Pale brown tinge, slightly cloudy, no odour or sheen.
12:40	2.0	20.3	7.16	3407	0.34	92.6	8.620	Poor recharge
12:43	3.0	20.2	7.20	3380	0.33	88.2	8.920	
12:46	4.0	20.1	7.20	3369	0.33	83.0	9.250	Same as above
12:49	5.0	20.1	7.20	3361	0.37	83.3	9.560	
12:52	6.0	20.1	7.20	3373	0.32	81.4	9.820	Parameters stable, samples collected.

Field QA Checks:		Container	Collected	Container	Collected	
Air bubbles in vials or violent reactions?	No	Green 500 mL Plastic	1	Red 60 mL Plastic	1	Duplicate collected? No
Decontamination as per GHD procedure?	Yes	Orange 100 mL Glass	1	Purple 2x40 mL Vials	1	Metals Filtered? Yes
Was sampling equipment pre-cleaned?	Yes	Purple 60 mL Plastic	1			
COC updated?	Yes					# Bottles collected 6

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc	Purge Volumes			
	Casing Int. Dia (mm)	50	100	150
	Vol (L/m of casing)	2.0	7.9	17.7



Purging and Sampling Record

Bore ID: BH112R

Job Information		Sampling Information		Bore Information	
Client: Transport for NSW	Purge Method: Low flow	SWL(mbTOC): 13.045 m	Logic Check: Yes		
Project: M12 Motorway	Sample Method: Micropurge	Screen: From to m			
Proj. No.: 12554717	WQ Meter Type: YSI	NAPL Check: Absent	Stick Up: m		
Sampler: E. Smith / A. Duval	Flow Cell: Yes	Pump Depth: 18 m	Ref.datum: TOC		
Date: 19/01/2024	WLevel Meter Type: Interface Probe	Bore Depth: 21.110 m	Bore Diam.: 50 mm		
Round January 2024	Field Filtered? Yes (disposable filter)	Well Cap Secure? Yes			

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
10:20	0.8	20.9	6.79	14331	0.49	123.2	13.380	Clear, no odour, no sheen, no sediment
10:25	1.6	21.0	6.79	14381	0.37	118.1	13.550	Flow rate decreased
10:30	2.4	21.2	6.79	14424	0.36	112.1	13.660	
10:35	3.2	21.2	6.79	14462	0.35	108.3	13.850	
10:40	4.0	21.2	6.79	14444	0.32	104.6	14.030	
10:45	4.8	21.1	6.79	14427	0.29	102.3	14.150	
10:50	5.6	21.1	6.79	14444	0.26	100.3	14.300	Parameters stable, samples collected

Field QA Checks:		Container	Collected	Container	Collected	
Air bubbles in vials or violent reactions?	No	Green 500 mL Plastic	1	Red 60 mL Plastic	1	Duplicate collected? No
Decontamination as per GHD procedure?	Yes	Orange 100 mL Glass	1	Purple 2x40 mL Vials	1	Metals Filtered? Yes
Was sampling equipment pre-cleaned?	Yes	Purple 60 mL Plastic	1			
COC updated?	Yes					# Bottles collected 6

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc	Purge Volumes			
	Casing Int. Dia (mm)	50	100	150
	Vol (L/m of casing)	2.0	7.9	17.7



Purging and Sampling Record

Bore ID: BH145R

Job Information		Sampling Information		Bore Information	
Client: Transport for NSW		Purge Method: Low flow		SWL(mbTOC): 11.260 m	Logic Check: Yes
Project: M12 Motorway		Sample Method: Micropurge		Screen: From to m	
Proj. No.: 12554717		WQ Meter Type: YSI		NAPL Check: Absent	Stick Up: - m
Sampler: E. Smith / A. Duval		Flow Cell: Yes	Pump Depth: 16 m	Ref.datum: TOC	Bore Diam.: 50 mm
Date: 18/01/2024		WLevel Meter Type: Interface Probe		Bore Depth: 19.950 m	Well Cap Secure? Yes
Round January 2024		Field Filtered? Yes (disposable filter)			

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
11:38	1.0	19.8	6.73	16187	0.43	43.2	11.310	Clear, no sediment, no odour or sheen, good recharge.
11:41	2.0	19.9	6.77	16162	0.16	54.8	11.320	
11:44	3.0	20.1	6.74	16190	0.10	-62.6	11.330	
11:47	4.0	19.8	6.74	15990	0.33	-67.9	11.345	
11:50	5.0	19.8	6.74	15977	0.05	-73.7	11.345	
11:53	6.0	19.8	6.74	16010	0.00	-78.0	11.345	
11:56	7.0	19.7	6.74	16091	0.00	-78.9	11.345	
11:59	8.0	19.8	6.75	16065	0.01	-80.7	11.345	Clear, no sediment, no odour or sheen, good recharge.
								Parameters stable, samples collected

Field QA Checks:		Container	Collected	Container	Collected		
Air bubbles in vials or violent reactions?	No	Green 500 mL Plastic	1	Red 60 mL Plastic	2	Duplicate collected?	Yes
Decontamination as per GHD procedure?	Yes	Orange 100 mL Glass	1	Purple 2x40 mL Vials	1	Metals Filtered?	Yes
Was sampling equipment pre-cleaned?	Yes	Purple 60 mL Plastic	1			# Bottles collected	7
COC updated?	Yes						

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc				Purge Volumes		
GWDUP1 ALS Metals				Casing Int. Dia (mm)	50	100 150
				Vol (L/m of casing)	2.0	7.9 17.7



Purging and Sampling Record

Bore ID: BH104R

Job Information		Sampling Information		Bore Information	
Client: Transport for NSW	Purge Method: Low flow	SWL(mbTOC): 11.075 m	Logic Check: Yes		
Project: M12 Motorway	Sample Method: Micropurge	Screen: From to m			
Proj. No.: 12554717	WQ Meter Type: YSI	NAPL Check: Absent	Stick Up: m		
Sampler: A. Duval, J. Miller	Flow Cell: Yes	Pump Depth: 17.1 m	Ref.datum: TOC		
Date: 13/02/2024	WLevel Meter Type: Interface Probe	Bore Depth: 18.125 m	Bore Diam.: 50 mm		
Round February 2024	Field Filtered? Yes (disposable filter)	Well Cap Secure? Yes			

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
10:40	0.8	22.8	6.69	8566	0.72	-52.5	11.240	White, slightly cloudy, no odour, no sheen, slight sediment
10:45	1.6	22.2	6.67	8384	0.50	-43.5	11.340	Clear, no odour, no sheen, no sediment
10:50	2.4	22.1	6.67	8376	0.40	-44.9	11.460	
10:55	3.2	21.9	6.67	8325	0.35	-47.3	11.480	
11:00	4.0	22.0	6.67	8336	0.31	-60.0	11.540	
11:05	4.8	21.9	6.68	8303	0.27	-95.8	11.590	Good recharge
11:10	5.6	21.8	6.68	8290	0.26	-105.2	11.620	
11:15	6.4	21.8	6.68	8312	0.25	-112.9	11.590	White, slightly cloudy, no odour, no sheen, no sediment
								Parameters stable, samples collected

Field QA Checks:		Container	Collected	Container	Collected		
Air bubbles in vials or violent reactions?	No	Green 500 mL Plastic	1	Red 60 mL Plastic	1	Duplicate collected?	No
Decontamination as per GHD procedure?	Yes	Orange 100 mL Glass	1	Purple 2x40 mL Vials	1	Metals Filtered?	Yes
Was sampling equipment pre-cleaned?	Yes	Purple 60 mL Plastic	1			# Bottles collected	6
COC updated?	Yes						

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc	Purge Volumes			
	Casing Int. Dia (mm)	50	100	150
	Vol (L/m of casing)	2.0	7.9	17.7



Purging and Sampling Record

Bore ID: BH107R

Job Information		Sampling Information		Bore Information	
Client: Transport for NSW		Purge Method: Low flow		SWL(mbTOC): 7.730 m	Logic Check: Yes
Project: M12 Motorway		Sample Method: Micropurge		Screen: From to m	
Proj. No.: 12554717		WQ Meter Type: YSI		NAPL Check: Absent	Stick Up: m
Sampler: A. Duval, J. Miller		Flow Cell: Yes	Pump Depth: 13.5 m	Ref.datum: TOC	Bore Diam.: 50 mm
Date: 13/02/2024		WLevel Meter Type: Interface Probe		Bore Depth: 14.490 m	Well Cap Secure? Yes
Round February 2024		Field Filtered? Yes (disposable filter)			

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
9:22	1.0	21.6	7.01	3849	1.07	5.2	8.060	Clear, no odour, no sheen, no sediment
9:27	2.0	20.9	6.97	3718	0.49	8.9	8.390	Flow rate adjusted
9:32	2.8	21.3	6.96	3631	0.52	22.1	8.690	Poor recharge
9:37	3.6	21.3	6.96	3588	0.56	34.2	9.020	
9:42	4.4	21.5	6.96	3558	0.61	42.4	9.210	
9:47	5.2	21.3	6.96	3540	0.61	47.4	9.440	
9:52	6.0	21.5	6.96	3539	0.62	50.1	9.640	
9:57	6.8	21.6	6.97	3542	0.63	53.5	9.920	Clear, no odour, no sheen, no sediment
								Parameters stable, samples collected

Field QA Checks:		Container	Collected	Container	Collected	
Air bubbles in vials or violent reactions?	No	Green 500 mL Plastic	1	Red 60 mL Plastic	2	Duplicate collected? Yes
Decontamination as per GHD procedure?	Yes	Orange 100 mL Glass	1	Purple 2x40 mL Vials	1	Metals Filtered? Yes
Was sampling equipment pre-cleaned?	Yes	Purple 60 mL Plastic	1			
COC updated?	Yes					# Bottles collected 7

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc GWDUP2 Eurofins Metals	Purge Volumes		
	Casing Int. Dia (mm)	50	100 150
	Vol (L/m of casing)	2.0	7.9 17.7



Purging and Sampling Record

Bore ID: BH112R

Job Information		Sampling Information		Bore Information	
Client: Transport for NSW	Purge Method: Low flow	SWL(mbTOC): 13.095 m	Logic Check: Yes		
Project: M12 Motorway	Sample Method: Micropurge	Screen: From to m			
Proj. No.: 12554717	WQ Meter Type: YSI	NAPL Check: Absent	Stick Up: m		
Sampler: A. Duval, J. Miller	Flow Cell: Yes	Pump Depth: 20.1 m	Ref.datum: TOC		
Date: 13/02/2024	WLevel Meter Type: Interface Probe	Bore Depth: 21.095 m	Bore Diam.: 50 mm		
Round February 2024	Field Filtered? Yes (disposable filter)	Well Cap Secure? Yes			

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
7:43	0.8	21.1	6.59	14742	1.28	59.7	13.220	Mostly clear, no odour, no sheen, no sediment
7:48	1.6	20.8	6.56	14440	0.71	67.3	13.380	Flow rate adjusted
7:59	2.4	21.1	6.56	14471	0.65	71.0	13.420	
8:04	3.2	20.9	6.57	14316	0.72	75.0	13.560	
8:09	4.0	20.8	6.56	14102	1.12	74.0	13.710	
8:14	4.8	20.8	6.55	14034	0.48	72.4	13.885	
8:19	5.6	20.8	6.55	13965	0.59	71.8	13.970	Moderate recharge
8:24	6.4	21.0	6.55	13913	0.51	72.5	14.090	
8:29	7.2	21.2	6.55	13913	0.42	74.1	14.230	Mostly clear, no odour, no sheen, no sediment
								Parameters stable, samples collected

Field QA Checks:		Container	Collected	Container	Collected	
Air bubbles in vials or violent reactions?	No	Green 500 mL Plastic	1	Red 60 mL Plastic	2	Duplicate collected? Yes
Decontamination as per GHD procedure?	Yes	Orange 100 mL Glass	1	Purple 2x40 mL Vials	1	Metals Filtered? Yes
Was sampling equipment pre-cleaned?	Yes	Purple 60 mL Plastic	1			
COC updated?	Yes					# Bottles collected 7

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc GWDUP1 ALS Metals	Purge Volumes			
	Casing Int. Dia (mm)	50	100	150
	Vol (L/m of casing)	2.0	7.9	17.7



Purging and Sampling Record

Bore ID: BH145R

Job Information		Sampling Information		Bore Information	
Client: Transport for NSW		Purge Method: Low flow		SWL(mbTOC): 11.300 m	Logic Check: Yes
Project: M12 Motorway		Sample Method: Micropurge		Screen: From to m	
Proj. No.: 12554717		WQ Meter Type: YSI		NAPL Check: Absent	Stick Up: m
Sampler: A. Duval, J. Miller		Flow Cell: Yes	Pump Depth: 18.9 m	Ref.datum: TOC	Bore Diam.: 50 mm
Date: 14/02/2024		WLevel Meter Type: Interface Probe		Bore Depth: 19.935 m	Well Cap Secure? Yes
Round February 2024		Field Filtered? Yes (disposable filter)			

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
11:30	0.8	22.8	6.53	17972	2.74	-58.7	11.320	Clear, slightly black, no odour or sheen, low sediment, low turbidity
11:35	1.6	20.8	6.50	17662	0.93	-72.2	11.340	
11:40	2.4	20.1	6.50	17398	0.48	-80.0	11.360	Clear, no odour or sheen, no sediment, low turbidity
11:45	3.2	20.4	6.51	17455	0.40	-82.8	11.380	
11:50	4.0	20.4	6.51	17385	0.41	-84.5	11.400	
11:55	4.8	20.4	6.51	17357	0.39	-85.1	11.420	Clear, no odour or sheen, no sediment, low turbidity
								Parameters stable, samples collected

Field QA Checks:		Container	Collected	Container	Collected	
Air bubbles in vials or violent reactions?	No	Green 500 mL Plastic	1	Red 60 mL Plastic	1	Duplicate collected? No
Decontamination as per GHD procedure?	Yes	Orange 100 mL Glass	1	Purple 2x40 mL Vials	1	Metals Filtered? Yes
Was sampling equipment pre-cleaned?	Yes	Purple 60 mL Plastic	1			
COC updated?	Yes					# Bottles collected 6

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc	Purge Volumes			
	Casing Int. Dia (mm)	50	100	150
	Vol (L/m of casing)	2.0	7.9	17.7



Groundwater Gauging Record

Client: TfNSW

Project: M12 Motorway

Job No.: 12554717

Location: Western Sydney, Sydney, NSW

WL Meter Type: Int.Fce

Date: 13-14/2/2024

Time:

Sampler: A. Duval, J. Miller

Well ID	Date	Accessible?	SWL (mbTOC)	BOC (mbTOC)	Data logger present?	Data logger brand type	Data logger downloaded?	Comment
BH104R*	13/02/2024	Yes	11.075	18.125	Yes	HOBO	Yes	
BH107R*	13/02/2024	Yes	7.730	14.490	Yes	Solinst	Yes	
BH112R*	13/02/2024	Yes	13.095	21.095	Yes	Solinst	Yes	
BH145R*	14/02/2024	Yes	11.300	19.935	Yes	HOBO	Yes	
BH155								Destroyed
BH162								Destroyed
BH170		Not located to date						
BH175	14/02/2024 10:27	Yes	5.143	17.861	Yes	Solinst	Yes	Not likely to be impacted by future works, track maintenance, clearing, and earthworks visible near the location
BH219	14/02/2024 13:53	Yes	0.565	18.236	Yes	HOBO		

* BH104, BH107 and BH112 destroyed November 2022 and replacement wells BH104R, BH107R and BH112R are now in use.

* BH145 is no longer in use as of April 2023 and replacement well BH145R is available for sampling.



Purging and Sampling Record

Bore ID: BH104R

Job Information		Sampling Information		Bore Information	
Client: Transport for NSW	Purge Method: Low flow	SWL(mbTOC): 11.050 m	Logic Check:		
Project: M12 Motorway	Sample Method: Micropurge	Screen: From to m			
Proj. No.: 12554717	WQ Meter Type: YSI	NAPL Check: Absent	Stick Up: m		
Sampler: E. Smith / A. Duval	Flow Cell: Yes	Pump Depth: 16 m	Ref.datum: TOC	Bore Diam.: 50 mm	
Date: 15/03/2024	WLevel Meter Type: Interface Probe	Bore Depth: 18.205 m	Well Cap Secure? Yes		
Round March 2024	Field Filtered? Yes (disposable filter)				

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
8:09	1.0	19.8	6.53	7775	0.54	-91.1	11.385	Clear, no odour, no sheen, slight sediment load
8:12	2.0	19.6	6.53	7788	0.30	-92.3	11.595	Clear, no odour, no sheen, no sediment
8:15	3.0	19.5	6.53	7766	0.14	-90.3	11.690	
8:18	4.0	19.6	6.53	7772	0.10	-90.1	11.815	
8:21	5.0	19.6	6.54	7770	0.03	-91.3	11.910	Clear, no odour, no sheen, no sediment
8:25	6.0	19.4	6.54	7754	0.01	-93.0	12.030	
8:28	7.0	19.4	6.55	7761	0.02	-96.3	12.040	
8:31	8.0	19.5	6.56	7763	-0.04	-102.4	12.095	Clear, no odour, no sheen, no sediment
								Parameters stable, samples collected
								Zero DO is unusual, consider looking at previous trend to decide
								if usable data. Occasional DO reading below 0 in negative

Field QA Checks:		Container	Collected	Container	Collected	Duplicate collected?	Yes
Air bubbles in vials or violent reactions?	No	Green 500 mL Plastic	1	Red 60 mL Plastic	1	Metals Filtered?	Yes
Decontamination as per GHD procedure?	Yes	Orange 100 mL Glass	1	Purple 2x40 mL Vials	1	# Bottles collected	7
Was sampling equipment pre-cleaned?	Yes	Purple 60 mL Plastic	1				
COC updated?	Yes						

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc GWDUP2 (Eurofins metals)	Purge Volumes			
	Casing Int. Dia (mm)	50	100	150
	Vol (L/m of casing)	2.0	7.9	17.7



Purging and Sampling Record

Bore ID: BH107R

Job Information		Sampling Information		Bore Information	
Client: Transport for NSW	Purge Method: Low flow	SWL(mbTOC): 7.795 m	Logic Check: Yes		
Project: M12 Motorway	Sample Method: Micropurge	Screen: From to m			
Proj. No.: 12554717	WQ Meter Type: YSI	NAPL Check: Absent	Stick Up: m		
Sampler: E. Smith / A. Duval	Flow Cell: Yes	Pump Depth: 13 m	Ref.datum: TOC		
Date: 15/03/2024	WLevel Meter Type: Interface Probe	Bore Depth: 14.560 m	Bore Diam.: 50 mm		
Round March 2024	Field Filtered? Yes (disposable filter)	Well Cap Secure? Yes			

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
9:39	1.0	19.2	6.89	3461	0.37	21.8	8.230	Pale brown, cloudy, no odour or sheen.
9:42	2.0	19.2	6.88	3447	0.23	23.1	8.650	Poor recharge.
9:45	3.0	19.2	6.88	3439	0.15	24.7	9.050	
9:48	4.0	19.2	6.87	3424	0.15	25.5	9.400	Same as above
9:51	5.0	19.3	6.87	3418	0.20	26.4	9.700	
9:54	6.0	19.3	6.87	3401	0.31	28.6	10.040	Flow rate reduced
9:57	7.0	19.3	6.87	3384	0.50	31.2	10.210	
10:00	8.0	19.4	6.87	3380	0.58	32.9	10.490	Same as above, poor recharge.
10:03	9.0	19.4	6.86	3325	0.98	37.7	10.660	
10:06	10.0	19.5	6.87	3284	1.29	40.3	10.770	DO still increasing, all other parameters stable.
10:09	11.0	19.6	6.87	3193	1.87	43.8	11.050	Samples collected now in interest of time spent on this location
								and volume purged relative to SWL change

Field QA Checks:		Container	Collected	Container	Collected	Duplicate collected?	
Air bubbles in vials or violent reactions?	No	Green 500 mL Plastic	1	Red 60 mL Plastic	1		No
Decontamination as per GHD procedure?	Yes	Orange 100 mL Glass	1	Purple 2x40 mL Vials	1		Metals Filtered? Yes
Was sampling equipment pre-cleaned?	Yes	Purple 60 mL Plastic	1				
COC updated?	Yes					# Bottles collected	6

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc	Purge Volumes			
	Casing Int. Dia (mm)	50	100	150
	Vol (L/m of casing)	2.0	7.9	17.7



Purging and Sampling Record

Bore ID: BH112R

Job Information		Sampling Information		Bore Information	
Client: Transport for NSW	Purge Method: Low flow	SWL(mbTOC): 13.141 m	Logic Check: Yes		
Project: M12 Motorway	Sample Method: Micropurge	Screen: From to m			
Proj. No.: 12554717	WQ Meter Type: YSI	NAPL Check: Absent	Stick Up: m		
Sampler: E. Smith / A. Duval	Flow Cell: Yes	Pump Depth: 19.5 m	Ref.datum: TOC		
Date: 15/03/2024	WLevel Meter Type: Interface Probe	Bore Depth: 21.180 m	Bore Diam.: 50 mm		
Round March 2024	Field Filtered? Yes (disposable filter)	Well Cap Secure? Yes			

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
14:14	0.8	20.7	6.35	14860	0.92	87.4	13.415	Pale brown, slightly cloudy, no odour or sheen.
14:17	1.6	20.6	6.34	14864	0.70	91.4	13.490	Clear, no odour, no sheen, no sediment
14:20	2.4	20.6	6.34	14861	0.52	95.8	13.620	
14:23	3.2	20.6	6.35	14858	0.45	97.6	13.790	
14:26	4.0	20.8	6.35	14919	0.52	98.3	13.815	Good recharge
14:29	4.8	21.2	6.36	15017	0.64	98.9	13.845	
14:32	5.6	21.8	6.36	15245	0.86	101.3	13.895	
14:35	6.4	21.9	6.36	15333	0.90	102.6	13.920	
14:38	7.2	22.1	6.37	15400	0.96	104.4	13.940	Clear, no odour, no sheen, no sediment
								Parameters stable, samples collected

Field QA Checks:		Container	Collected	Container	Collected	Duplicate collected?	
Air bubbles in vials or violent reactions?	No	Green 500 mL Plastic	1	Red 60 mL Plastic	1		No
Decontamination as per GHD procedure?	Yes	Orange 100 mL Glass	1	Purple 2x40 mL Vials	1		Metals Filtered? Yes
Was sampling equipment pre-cleaned?	Yes	Purple 60 mL Plastic	1				
COC updated?	Yes						# Bottles collected

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc	Purge Volumes			
	Casing Int. Dia (mm)	50	100	150
	Vol (L/m of casing)	2.0	7.9	17.7



Purging and Sampling Record

Bore ID: BH145R

Job Information		Sampling Information		Bore Information	
Client: Transport for NSW	Purge Method: Low flow	SWL(mbTOC): 11.270 m	Logic Check: Yes		
Project: M12 Motorway	Sample Method: Micropurge	Screen: From to m			
Proj. No.: 12554717	WQ Meter Type: YSI	NAPL Check: Absent	Stick Up: m		
Sampler: E. Smith / A. Duval	Flow Cell: Yes	Pump Depth: 19 m	Ref.datum: TOC		
Date: 14/03/2024	WLevel Meter Type: Interface Probe	Bore Depth: 20.010 m	Bore Diam.: 50 mm		
Round March 2024	Field Filtered? Yes (disposable filter)	Well Cap Secure? Yes			

Time	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m bTOC)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable	
11:28	1.0	20.5	6.27	17481	0.55	-75.4	11.360	Pale grey, some grey sediment load, mostly clear,
11:32	2.0	20.1	6.28	17380	0.25	-90.2	11.360	sulfuric odour, no sheen.
11:36	3.0	20.1	6.28	17522	0.12	-97.2	11.360	Pale grey tinge, most clear, slight sulfuric odour, no sheen.
11:40	4.0	20.0	6.28	17488	0.07	-101.0	11.360	
11:44	5.0	19.9	6.29	17467	0.04	-103.5	11.360	Same as above.
11:48	6.0	19.9	6.29	17378	0.00	-106.2	11.360	
11:52	7.0	19.7	6.29	17323	0.00	-107.8	11.360	Parameters stable, samples collected.
								Zero DO is unusual, consider looking at previous trend to decide
								if usable data. Occasional DO reading below 0 in negative

Field QA Checks:		Container	Collected	Container	Collected		
Air bubbles in vials or violent reactions?	No	Green 500 mL Plastic	1	Red 60 mL Plastic	1	Duplicate collected?	Yes
Decontamination as per GHD procedure?	Yes	Orange 100 mL Glass	1	Purple 2x40 mL Vials	1	Metals Filtered?	Yes
Was sampling equipment pre-cleaned?	Yes	Purple 60 mL Plastic	1				
COC updated?	Yes					# Bottles collected	7

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc GWDUP1 (ALS metals) collected.	Purge Volumes		
	Casing Int. Dia (mm)	50	100 150
	Vol (L/m of casing)	2.0	7.9 17.7

Appendix H

Laboratory reports



CHAIN OF CUSTODY

ALS Laboratory
please tick →

Subcon: Lab / Split WO:

Lab / Analyte: Barium - sulphate

Organic: 440012

Relinquish: Date:

Environmental Division
Sydney

Work Order Reference

ES2334428

CLIENT: GHD Pty Ltd	Connect	TURNAROUND REQUIREMENT ☐ Standard-TAT (List due date):	STANDARD TAT
OFFICE: Sydney	WO No:	(Standard TAT may be longer for some tests e.g. Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	
PROJECT: M12 Surface Water	Assigned	ALS QUOTE NO: <u>SY322/21</u>	COC SEQUENCE NUMBER (Circle)
ORDER NUMBER: 12554717			COC: 1 2 3 4 5 6 7
PROJECT MANAGER: Henry Luo		CONTACT PH: Henry Luo 0414 090 002	OF: 1 2 3 4 5 6 7
SAMPLER: Emily Smith, Terry Nham	SAMPLER MOBILE: 0431 522 928	RELINQUISHED BY: Emily Smith	RECEIVED BY: <u>Jack</u>
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): ESDAT	DATE/TIME: 6-10-2023 16:15	DATE/TIME: <u>06/10/23 1615</u>
Email Reports to: henry.luo@ghd.com , ghdlabreports@ghd.com; terry.nham@ghd.com, emily.smith@ghd.com; andrew.duval@ghd.com			



Telephone : + 61-2-8784 8555

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Please use separate workorders for the M12 Groundwater and M12 Surface Water COCs provided

ALS USE	SAMPLE DETAILS				CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).													
	MATRIX: SOLID (S) WATER (W)																			
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	Comments	TOTAL CONTAINERS	EA015H (TDS)	EA025H (TSS)	EA035H (TSS)	EA045H (TSS)	EA055H (TSS)	EA065H (TSS)	EA075H (TSS)	EA085H (TSS)	EA095H (TSS)	EA105H (TSS)	EA115H (TSS)	EA125H (TSS)	EA135H (TSS)	EA145H (TSS)	EA155H (TSS)
1	HA00S	6/10/2023	Water		11															
2	HA00S	6/10/2023	Water		11		X													
3	HA00S	6/10/2023	Water		11		X	X												
4	CO00S	6/10/2023	Water		11															
5	CO00S	6/10/2023	Water		11		X													
6	HA00S	6/10/2023	Water		11															
7	HA00S	6/10/2023	Water		11															
8	KEMDS	6/10/2023	Water		11		X													
9	KEMDS	6/10/2023	Water		11															
10	RO00S	6/10/2023	Water		11															
11	RO00S	6/10/2023	Water		11															
12	SO00S	6/10/2023	Water		11		X													
13	SO00S	6/10/2023	Water		11		X													
14	SW00P1	6/10/2023	Water		1															
15	SW00P2	6/10/2023	Water		1															
16	SW00P3	6/10/2023	Water		1															

HT

Brandon 10/10/23 1:55 4-5

1033274

CHAIN OF CUSTODY RECORD

CLIENT DETAILS

Page 1 of 1

Company Name : GHD Pty Ltd, Sydney	Contact Name : Emily Smith 0433 522 928	Purchase Order : 12554717	COC Number :
Office Address :	Project Manager: Henry Luo 0434 958 062	PROJECT Number : 12554717	Eurofins mgt quote ID :
Level 15, 133 Castlereagh Street, Sydney NSW 2000	Email for results : emily.smith@ghd.com; terry.nham@ghd.com; henry.luo@ghd.com; esdat+ghd_au@esdatlabsync.net	PROJECT Name : M12 Water Sampling	Data output format: ESDAT

Special Directions & Comments :	Analytes							Some common holding times (with correct preservation).			
								For further information contact the lab			
Sample from ALS	Dissolved metals	Total metals						Waters		Soils	
								BTEX, MAH, VOC	14 days	BTEX, MAH, VOC	14 days
								TRH, PAH, Phenols, Pesticides	7 days	TRH, PAH, Phenols, Pesticides	14 days
								Heavy Metals	6 months	Heavy Metals	6 months
								Mercury, CrVI	28 days	Mercury, CrVI	28 days
								Microbiological testing	24 hours	Microbiological testing	72 hours
								BOD, Nitrate, Nitrite, Total N	2 days	Anions	28 days
								Solids - TSS, TDS etc	7 days	SPOCAS, pH Field and FOX, CrS	24 hours
								Ferrous iron	7 days	ASLP, TCLP	7 days
Eurofins mgt DI water batch number:											

	Sample ID	Date	Matrix	Dissolved metals	Total metals						Containers:								Sample comments:
											500P	250P	60P	1LA	40mL vial	200mL A	Jar	Bag	
1	SWDUPC	06/10/2023	Water		X								1						
2	QWDUPC	06/10/2023	Water	X															
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Relinquished By: Emily Smith	Received By:	Method Of Shipment	Temperature on arrival:
Date & Time : 06-10-2023 16:15	Date & Time :	☐ Courier ☐ Hand Delivered ☐ Postal	Report number:
Signature: esmith	Signature:	Courier Consignment # :	

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road Dandenong South VIC 3175 Tel: +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 Tel: +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 Tel: +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 Tel: +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 Tel: +61 7 3902 4600 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 Tel: +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

Eurofins ARL Pty Ltd

ABN: 91 05 0159 898

Perth
46-48 Banksia Road Welshpool WA 6106 Tel: +61 8 6253 4444 NATA# 2377 Site# 2370

Eurofins Environment Testing NZ Ltd

NZBN: 9429046024954

Auckland	Christchurch	Tauranga
35 O'Rourke Road Penrose, Auckland 1061 Tel: +64 9 526 4551 IANZ# 1327	43 Detroit Drive Rolleston, Christchurch 7675 Tel: +64 3 343 5201 IANZ# 1290	1277 Cameron Road, Gate Pa, Tauranga 3112 Tel: +64 9 525 0568 IANZ# 1402

Sample Receipt Advice

Company name:	GHD Pty Ltd NSW
Contact name:	Henry Luo
Project name:	M12 WATER SAMPLING
Project ID:	12554717
Turnaround time:	5 Day
Date/Time received	Oct 10, 2023 1:55 PM
Eurofins reference	1033274

Sample Information

- ✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ Sample Temperature of chilled sample on the batch as recorded by Eurofins Sample Receipt : 4.5 degrees Celsius.
- ✓ All samples have been received as described on the above COC.
- ✓ COC has been completed correctly.
- ✓ Attempt to chill was evident.
- ✓ Appropriately preserved sample containers have been used.
- ✓ All samples were received in good condition.
- ✓ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ✓ Appropriate sample containers have been used.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Bonnie Pu on phone : or by email: BonniePu@eurofins.com

Results will be delivered electronically via email to Henry Luo - henry.luo@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd NSW email address.



Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne 6 Monterey Road Dandenong South VIC 3175 Tel: +61 3 8564 5000 NATA# 1261 Site# 1254	Geelong 19/8 Lewalan Street Grovedale VIC 3216 Tel: +61 3 8564 5000 NATA# 1261 Site# 25403	Sydney 179 Magowar Road Girraween NSW 2145 Tel: +61 2 9900 8400 NATA# 1261 Site# 18217	Canberra Unit 1,2 Dacre Street Mitchell ACT 2911 Tel: +61 2 6113 8091 NATA# 1261 Site# 25466	Brisbane 1/21 Smallwood Place Murarrie QLD 4172 Tel: +61 7 3902 4600 NATA# 1261 Site# 20794	Newcastle 1/2 Frost Drive Mayfield West NSW 2304 Tel: +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

Eurofins ARL Pty Ltd

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Eurofins Environment Testing NZ Ltd

NZBN: 9429046024954

Auckland 35 O'Rorke Road Penrose, Auckland 1061 Tel: +64 9 526 4551 IANZ# 1327	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 Tel: +64 3 343 5201 IANZ# 1290	Tauranga 1277 Cameron Road, Gate Pa, Tauranga 3112 Tel: +64 9 525 0568 IANZ# 1402

web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Company Name:	GHD Pty Ltd NSW	Order No.:		Received:	Oct 10, 2023 1:55 PM
Address:	Level 15, 133 Castlereagh Street Sydney NSW 2000	Report #:	1033274	Due:	Oct 16, 2023
		Phone:	02 9239 7100	Priority:	5 Day
		Fax:	02 9239 7199	Contact Name:	Henry Luo
Project Name:	M12 WATER SAMPLING				
Project ID:	12554717				
Eurofins Analytical Services Manager : Bonnie Pu					

Sample Detail						Metals M8	Metals M8 filtered
Sydney Laboratory - NATA # 1261 Site # 18217						X	X
External Laboratory							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	SWDUP2	Oct 04, 2023		Water	S23-Oc0020102	X	
2	GWDUP2	Oct 06, 2023		Water	S23-Oc0020103		X
Test Counts						1	1

GHD Pty Ltd NSW
Level 15, 133 Castlereagh Street
Sydney
NSW 2000



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition
Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection, proficiency testing scheme providers and
reference materials producers reports and certificates.

Attention: Henry Luo

Report 1033274-W
Project name M12 WATER SAMPLING
Project ID 12554717
Received Date Oct 10, 2023

Client Sample ID			SWDUP2	GWDUP2
Sample Matrix			Water	Water
Eurofins Sample No.			S23- Oc0020102	S23- Oc0020103
Date Sampled			Oct 04, 2023	Oct 06, 2023
Test/Reference	LOR	Unit		
Heavy Metals				
Arsenic	0.001	mg/L	0.001	-
Arsenic (filtered)	0.001	mg/L	-	< 0.001
Cadmium	0.0002	mg/L	< 0.0002	-
Cadmium (filtered)	0.0002	mg/L	-	< 0.0002
Chromium	0.001	mg/L	< 0.001	-
Chromium (filtered)	0.001	mg/L	-	< 0.001
Copper	0.001	mg/L	0.006	-
Copper (filtered)	0.001	mg/L	-	0.003
Lead	0.001	mg/L	< 0.001	-
Lead (filtered)	0.001	mg/L	-	< 0.001
Mercury	0.0001	mg/L	< 0.0001	-
Mercury (filtered)	0.0001	mg/L	-	< 0.0001
Nickel	0.001	mg/L	0.002	-
Nickel (filtered)	0.001	mg/L	-	0.006
Zinc	0.005	mg/L	0.020	-
Zinc (filtered)	0.005	mg/L	-	0.014

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Metals M8	Sydney	Oct 10, 2023	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Metals M8 filtered	Sydney	Oct 10, 2023	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			



Melbourne 6 Monterey Road Dandenong South VIC 3175 Tel: +61 3 8564 5000 NATA# 1261 Site# 1254	Geelong 19/8 Lewalan Street Grovedale VIC 3216 Tel: +61 3 8564 5000 NATA# 1261 Site# 25403	Sydney 179 Magowar Road Girraween NSW 2145 Tel: +61 2 9900 8400 NATA# 1261 Site# 18217	Canberra Unit 1,2 Dacre Street Mitchell ACT 2911 Tel: +61 2 6113 8091 NATA# 1261 Site# 25466	Brisbane 1/21 Smallwood Place Murarrie QLD 4172 Tel: +61 7 3902 4600 NATA# 1261 Site# 20794	Newcastle 1/2 Frost Drive Mayfield West NSW 2304 Tel: +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

Perth 46-48 Banksia Road Welshpool WA 6106 Tel: +61 8 6253 4444 NATA# 2377 Site# 2370

Auckland 35 O'Rorke Road Penrose, Auckland 1061 Tel: +64 9 526 4551 IANZ# 1327	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 Tel: +64 3 343 5201 IANZ# 1290	Tauranga 1277 Cameron Road, Gate Pa, Tauranga 3112 Tel: +64 9 525 0568 IANZ# 1402

Company Name: GHD Pty Ltd NSW
Address: Level 15, 133 Castlereagh Street
Sydney
NSW 2000

Project Name: M12 WATER SAMPLING
Project ID: 12554717

Order No.:
Report #: 1033274
Phone: 02 9239 7100
Fax: 02 9239 7199

Received: Oct 10, 2023 1:55 PM
Due: Oct 16, 2023
Priority: 5 Day
Contact Name: Henry Luo

Eurofins Analytical Services Manager : Bonnie Pu

Sample Detail						Metals M8	Metals M8 filtered
						X	X
Sydney Laboratory - NATA # 1261 Site # 18217							
External Laboratory							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	SWDUP2	Oct 04, 2023		Water	S23-Oc0020102	X	
2	GWDUP2	Oct 06, 2023		Water	S23-Oc0020103		X
Test Counts						1	1

Internal Quality Control Review and Glossary

General

- Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
- All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
- All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
- Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
- Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
- SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
- Samples were analysed on an 'as received' basis.
- Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
- This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	µg/L: micrograms per litre
ppm: parts per million	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit		

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (<i>bis</i> -tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR: RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

- Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
- Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
- pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
- Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
- For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
- Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank									
Heavy Metals									
Arsenic			mg/L	< 0.001			0.001	Pass	
Arsenic (filtered)			mg/L	< 0.001			0.001	Pass	
Cadmium			mg/L	< 0.0002			0.0002	Pass	
Cadmium (filtered)			mg/L	< 0.0002			0.0002	Pass	
Chromium			mg/L	< 0.001			0.001	Pass	
Chromium (filtered)			mg/L	< 0.001			0.001	Pass	
Copper			mg/L	< 0.001			0.001	Pass	
Copper (filtered)			mg/L	< 0.001			0.001	Pass	
Lead			mg/L	< 0.001			0.001	Pass	
Lead (filtered)			mg/L	< 0.001			0.001	Pass	
Mercury			mg/L	< 0.0001			0.0001	Pass	
Mercury (filtered)			mg/L	< 0.0001			0.0001	Pass	
Nickel			mg/L	< 0.001			0.001	Pass	
Nickel (filtered)			mg/L	< 0.001			0.001	Pass	
Zinc			mg/L	< 0.005			0.005	Pass	
Zinc (filtered)			mg/L	< 0.005			0.005	Pass	
LCS - % Recovery									
Heavy Metals									
Arsenic			%	97			80-120	Pass	
Arsenic (filtered)			%	96			80-120	Pass	
Cadmium			%	96			80-120	Pass	
Cadmium (filtered)			%	91			80-120	Pass	
Chromium			%	98			80-120	Pass	
Chromium (filtered)			%	98			80-120	Pass	
Copper			%	98			80-120	Pass	
Copper (filtered)			%	95			80-120	Pass	
Lead			%	98			80-120	Pass	
Lead (filtered)			%	98			80-120	Pass	
Mercury			%	98			80-120	Pass	
Mercury (filtered)			%	99			80-120	Pass	
Nickel			%	96			80-120	Pass	
Nickel (filtered)			%	97			80-120	Pass	
Zinc			%	98			80-120	Pass	
Zinc (filtered)			%	95			80-120	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	N23-Oc0018535	NCP	%	96			75-125	Pass	
Cadmium	N23-Oc0018535	NCP	%	86			75-125	Pass	
Chromium	N23-Oc0018535	NCP	%	94			75-125	Pass	
Copper	N23-Oc0018535	NCP	%	91			75-125	Pass	
Lead	N23-Oc0018535	NCP	%	93			75-125	Pass	
Mercury	N23-Oc0018535	NCP	%	90			75-125	Pass	
Nickel	N23-Oc0018535	NCP	%	92			75-125	Pass	
Zinc	N23-Oc0018535	NCP	%	88			75-125	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic (filtered)	S23-Oc0020148	NCP	%	99			75-125	Pass	
Cadmium (filtered)	S23-Oc0020148	NCP	%	88			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Chromium (filtered)	S23-Oc0020148	NCP	%	92			75-125	Pass	
Copper (filtered)	S23-Oc0020148	NCP	%	88			75-125	Pass	
Lead (filtered)	S23-Oc0020148	NCP	%	90			75-125	Pass	
Mercury (filtered)	S23-Oc0020148	NCP	%	89			75-125	Pass	
Nickel (filtered)	S23-Oc0020148	NCP	%	88			75-125	Pass	
Zinc (filtered)	S23-Oc0020148	NCP	%	88			75-125	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	B23-Oc0013326	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium	B23-Oc0013326	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium	B23-Oc0013326	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper	B23-Oc0013326	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Lead	B23-Oc0013325	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Mercury	B23-Oc0013326	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel	B23-Oc0013326	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Zinc	B23-Oc0013326	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic (filtered)	S23-Oc0020050	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium (filtered)	S23-Oc0020050	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium (filtered)	S23-Oc0020050	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper (filtered)	S23-Oc0020050	NCP	mg/L	0.001	0.001	4.4	30%	Pass	
Lead (filtered)	S23-Oc0020050	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Mercury (filtered)	S23-Oc0020050	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel (filtered)	S23-Oc0020050	NCP	mg/L	0.001	0.002	16	30%	Pass	
Zinc (filtered)	S23-Oc0020050	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	

Comments
Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Bonnie Pu	Analytical Services Manager
Fang Yee Tan	Senior Analyst-Metal
Mickael Ros	Senior Analyst-Metal



Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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CHAIN OF CUSTODY

ALS Laboratory
please tick →

Environmental Division
Sydney

Work Order Reference
ES2338893



Telephone : + 61-2-9784 8556

N/A
N/A

Arany
13/11 10:50am
b.2

CLIENT: GHD Pty Ltd	TURNAROUND REQUIREMENT ☐ Standard TAT (List due date):	STANDARD TAT	FOR LAB
OFFICE: Sydney	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):		Custody Si
PROJECT: M12 Surface Water	ALS QUOTE NO.: 5195201	COC SEQUENCE NUMBER (Circle)	Free ice / f
ORDER NUMBER: 12554717		COC: 1 2 3 4 5 6 7	Random S
PROJECT MANAGER: Henry Luo	CONTACT PH: Henry Luo 0414 090 002	OF: 1 2 3 4 5 6 7	Other com
SAMPLER: Emily Smith, Andrew Duval	SAMPLER MOBILE: 0431 522 928	RECEIVED BY: Ashid	RELINQUISHE
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): ESDAT	DATE/TIME: 9/11/2023 - 4pm	DATE/TIME:
Email Reports to: emily.smith@ghd.com; henry.luo@ghd.com; andrew.duval@ghd.com; esdat+ghd_au@esdatlabsync.net			

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Please keep M12 Groundwater as a separate workorder to M12 Surface Water as per the COCs provided.

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).													
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	Comments	TOTAL CONTAINERS	Water	Soil	Sludge	Rock	Aggregate	Gravel	Sand	Clay	Fill	Debris	Other	SP-080 (STEM)	SP-080 (STEM)	SP-080 (STEM)
1	BADDS	9/11/2023	Water	HIT	11	X	X	X	X	X							X	X	X
2	BADMS	9/11/2023	Water		11	X	X	X	X	X							X	X	X
3	BADUS	9/11/2023	Water		11	X	X	X	X	X							X	X	X
4	QOSDS	9/11/2023	Water		11	X	X	X	X	X							X	X	X
5	QOSUS	9/11/2023	Water		11	X	X	X	X	X				X			X	X	X
6	HINDS	9/11/2023	Water		11	X	X	X	X	X				X			X	X	X
7	HINDUS	9/11/2023	Water		11	X	X	X	X	X				X			X	X	X
8	KEMUS	9/11/2023	Water		11	X	X	X	X	X				X			X	X	X
9	KEMUS	9/11/2023	Water		11	X	X	X	X	X				X			X	X	X
10	ROPOS	9/11/2023	Water		11	X	X	X	X	X				X			X	X	X
11	ROPOS	9/11/2023	Water		11	X	X	X	X	X				X			X	X	X
12	SOOSDS	9/11/2023	Water		11	X	X	X	X	X				X			X	X	X
13	SOOUS	9/11/2023	Water		11	X	X	X	X	X				X			X	X	X
14	SWDUP1	9/11/2023	Water		1	X													
15	SWDUP2	9/11/2023	Water	PLEASE FORWARD TO EUROFIN	1														

1043528



CLIENT: GHD Pty Ltd		TURNAROUND REQUIREMENT ☐ Standard TAT (List due date):		STANDARD TAT		FOR LABORATORY USE ONLY (Circle)	
OFFICE: Sydney		(Standard TAT may be longer for some tests e.g., Ultra Trace ☐ Non Standard or urgent TAT (List due date):				Custody Seal intact? Yes No N/A	
PROJECT: M12 Groundwater		ALS QUOTE NO.: 3111234		COC SEQUENCE NUMBER (Circle)		Free ice / frozen ice bricks present upon receipt? Yes No N/A	
ORDER NUMBER: 12554717				COC: 1 2 3 4 5 6 7		Random Sample Temperature on Receipt: °C	
PROJECT MANAGER: Henry Luo		CONTACT PH: Henry Luo 08141000102		OF: 1 2 3 4 5 6 7		Other comment:	
SAMPLER: Emily Smith, Andrew Duval		SAMPLER MOBILE: 0431 522 928		RELINQUISHED BY:		RECEIVED BY:	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default): ESDAT		Andrew Duval (GHD)		Ashid	
Email Reports to: emily.smith@ghd.com; Henry Luo@ghd.com; andrew.duval@ghd.com; esdat+ghd_au@esdatlabsync.net		DATE/TIME: 9/11/2023 - 4pm		DATE/TIME: 9/11/1615		DATE/TIME:	

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Please keep M12 Groundwater as a separate workorder to M12 Surface Water as per the JHCCs provided.

[illegible]

CHAIN OF CUSTODY RECORD

CLIENT DETAILS

Page 1 of 1

Company Name : GHD Pty Ltd Sydney	Contact Name : Emily Smith 0411 022 826	Purchase Order : 12554717	COC Number :
Office Address :	Project Manager: Henry Luo 0414 080 002	PROJECT Number : 12554717	Eurofins mgt quote ID :
Email for results : emily.smith@ghd.com; henry.luo@ghd.com; andrew.duval@ghd.com; esdat+ghd_au@esdatlabsync.net	PROJECT Name : 812 Ryke + 3 sample	Data output format: ESDAT	

Special Directions & Comments :	Analytes						Some common holding times (with correct preservation). For further information contact the lab			
	Waters		Soils							
Sent from ALB	BTEX, MAH, VOC	14 days	BTEX, MAH, VOC	14 days						
	TRH, PAH, Phenols, Pesticides	7 days	TRH, PAH, Phenols, Pesticides	14 days						
	Heavy Metals	6 months	Heavy Metals	6 months						
	Mercury, CrVI	28 days	Mercury, CrVI	28 days						
	Microbiological testing	24 hours	Microbiological testing	72 hours						
	BOD, Nitrate, Nitrite, Total N	2 days	Anions	28 days						
	Solids - TSS, TDS etc	7 days	SPOCAS, pH Field and FOX, CrS	24 hours						
	Ferrous iron	7 days	ASLP, TCLP	7 days						

Eurofins | mgt DI water batch number:

	Sample ID	Date	Matrix	Site name	Collection						Containers:								Sample comments:
											500P	250P	80P	1LA	40mL vial	200mL A	Jar	Bag	
1	SWD001	9/11/2023	Water		X								1						
2	SWD002	9/11/2023	Water										1						
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Relinquished By: Andrew Duval	Received By: 	Method Of Shipment	Temperature on arrival:
Date & Time : 9/11/2023 - 4pm	Date & Time :	☐ Courier ☐ Hand Delivered ☐ Postal ☐ Courier Consignment # :	Report number:
Signature:	Signature:		

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road Dandenong South VIC 3175 Tel: +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 Tel: +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 Tel: +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 Tel: +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 Tel: +61 7 3902 4600 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 Tel: +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

Eurofins ARL Pty Ltd

ABN: 91 05 0159 898

Perth
46-48 Banksia Road Welshpool WA 6106 Tel: +61 8 6253 4444 NATA# 2377 Site# 2370

Eurofins Environment Testing NZ Ltd

NZBN: 9429046024954

Auckland	Christchurch	Tauranga
35 O'Rourke Road Penrose, Auckland 1061 Tel: +64 9 526 4551 IANZ# 1327	43 Detroit Drive Rolleston, Christchurch 7675 Tel: +64 3 343 5201 IANZ# 1290	1277 Cameron Road, Gate Pa, Tauranga 3112 Tel: +64 9 525 0568 IANZ# 1402

Sample Receipt Advice

Company name:	GHD Pty Ltd NSW
Contact name:	Henry Luo
Project name:	M12 SURFACE WATER
Project ID:	12554717
Turnaround time:	5 Day
Date/Time received	Nov 13, 2023 10:50 AM
Eurofins reference	1043528

Sample Information

- ✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ Sample Temperature of chilled sample on the batch as recorded by Eurofins Sample Receipt : 6.7 degrees Celsius.
- ✓ All samples have been received as described on the above COC.
- ✓ COC has been completed correctly.
- ✓ Attempt to chill was evident.
- ✓ Appropriately preserved sample containers have been used.
- ✓ All samples were received in good condition.
- ✓ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ✓ Appropriate sample containers have been used.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Bonnie Pu on phone : or by email: BonniePu@eurofins.com

Results will be delivered electronically via email to Henry Luo - henry.luo@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd NSW email address.



web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road Dandenong South VIC 3175 Tel: +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 Tel: +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 Tel: +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 Tel: +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 Tel: +61 7 3902 4600 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 Tel: +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

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Company Name: GHD Pty Ltd NSW
Address: Level 15, 133 Castlereagh Street
Sydney
NSW 2000

Project Name: M12 SURFACE WATER
Project ID: 12554717

Order No.:
Report #: 1043528
Phone: 02 9239 7100
Fax: 02 9239 7199

Received: Nov 13, 2023 10:50 AM
Due: Nov 20, 2023
Priority: 5 Day
Contact Name: Henry Luo

Eurofins Analytical Services Manager : Bonnie Pu

Sample Detail

Metals M8

Metals M8 filtered

Sydney Laboratory - NATA # 1261 Site # 18217

External Laboratory

No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	SWDUP2	Nov 09, 2023		Water	S23-No0029281	X	
2	GWDUP2	Nov 08, 2023		Water	S23-No0029282		X
Test Counts						1	1

GHD Pty Ltd NSW
Level 15, 133 Castlereagh Street
Sydney
NSW 2000



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition
Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection, proficiency testing scheme providers and
reference materials producers reports and certificates.

Attention: Henry Luo

Report 1043528-W
Project name M12 WATER SAMPLING
Project ID 12554717
Received Date Nov 13, 2023

Client Sample ID			SWDUP2	GWDUP2
Sample Matrix			Water	Water
Eurofins Sample No.			S23- No0029281	S23- No0029282
Date Sampled			Nov 09, 2023	Nov 08, 2023
Test/Reference	LOR	Unit		
Heavy Metals				
Arsenic	0.001	mg/L	0.001	-
Arsenic (filtered)	0.001	mg/L	-	< 0.001
Cadmium	0.0002	mg/L	< 0.0002	-
Cadmium (filtered)	0.0002	mg/L	-	< 0.0002
Chromium	0.001	mg/L	< 0.001	-
Chromium (filtered)	0.001	mg/L	-	< 0.001
Copper	0.001	mg/L	< 0.001	-
Copper (filtered)	0.001	mg/L	-	0.005
Lead	0.001	mg/L	< 0.001	-
Lead (filtered)	0.001	mg/L	-	< 0.001
Mercury	0.0001	mg/L	< 0.0001	-
Mercury (filtered)	0.0001	mg/L	-	< 0.0001
Nickel	0.001	mg/L	< 0.001	-
Nickel (filtered)	0.001	mg/L	-	0.004
Zinc	0.005	mg/L	< 0.005	-
Zinc (filtered)	0.005	mg/L	-	0.012

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Metals M8 - Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS	Sydney	Nov 15, 2023	28 Days
Metals M8 filtered - Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS	Sydney	Nov 14, 2023	28 Days



Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road Dandenong South VIC 3175 Tel: +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 Tel: +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 Tel: +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 Tel: +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 Tel: +61 7 3902 4600 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 Tel: +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

Perth
46-48 Banksia Road Welshpool WA 6106 Tel: +61 8 6253 4444 NATA# 2377 Site# 2370

Auckland	Christchurch	Tauranga
35 O'Rorke Road Penrose, Auckland 1061 Tel: +64 9 526 4551 IANZ# 1327	43 Detroit Drive Rolleston, Christchurch 7675 Tel: +64 3 343 5201 IANZ# 1290	1277 Cameron Road, Gate Pa, Tauranga 3112 Tel: +64 9 525 0568 IANZ# 1402

Company Name: GHD Pty Ltd NSW
Address: Level 15, 133 Castlereagh Street
Sydney
NSW 2000

Project Name: M12 WATER SAMPLING
Project ID: 12554717

Order No.: 12554717
Report #: 1043528
Phone: 02 9239 7100
Fax: 02 9239 7199

Received: Nov 13, 2023 10:50 AM
Due: Nov 20, 2023
Priority: 5 Day
Contact Name: Henry Luo

Eurofins Analytical Services Manager : Bonnie Pu

Sample Detail

Metals M8

Metals M8 filtered

Melbourne Laboratory - NATA # 1261 Site # 1254

Sydney Laboratory - NATA # 1261 Site # 18217

External Laboratory

No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	SWDUP2	Nov 09, 2023		Water	S23-No0029281	X	
2	GWDUP2	Nov 08, 2023		Water	S23-No0029282		X

Test Counts

1

1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follow guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013. They are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry weight basis unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion unless otherwise stated.
4. For CEC results where the sample's origin is unknown or environmentally contaminated, the results should be used advisedly.
5. Actual LORs are matrix dependent. Quoted LORs may be raised where sample extracts are diluted due to interferences.
6. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
7. SVOC analysis on waters is performed on homogenised, unfiltered samples unless noted otherwise.
8. Samples were analysed on an 'as received' basis.
9. Information identified in this report with **blue** colour indicates data provided by customers that may have an impact on the results.
10. This report replaces any interim results previously issued.

Holding Times

Please refer to the 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours before sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and despite any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling; therefore, compliance with these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether, the holding time is 7 days; however, for all other VOCs, such as BTEX or C6-10 TRH, the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	µg/L: micrograms per litre
ppm: parts per million	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit		

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples, these are performed on laboratory-certified clean sands and in the case of water samples, these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (<i>bis</i> -tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30%; however the following acceptance guidelines are equally

applicable: Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR: RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%

PFAS field samples that contain surrogate recoveries above the QC limit designated in QSM 5.4, where no positive PFAS results have been reported, have been reviewed, and no data was affected.

QC Data General Comments

1. Where a result is reported as less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown are not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data; thus, it is possible to have two sets of data.

Quality Control Results

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank									
Heavy Metals									
Arsenic			mg/L	< 0.001			0.001	Pass	
Arsenic (filtered)			mg/L	< 0.001			0.001	Pass	
Cadmium			mg/L	< 0.0002			0.0002	Pass	
Cadmium (filtered)			mg/L	< 0.0002			0.0002	Pass	
Chromium			mg/L	< 0.001			0.001	Pass	
Chromium (filtered)			mg/L	< 0.001			0.001	Pass	
Copper			mg/L	< 0.001			0.001	Pass	
Copper (filtered)			mg/L	< 0.001			0.001	Pass	
Lead			mg/L	< 0.001			0.001	Pass	
Lead (filtered)			mg/L	< 0.001			0.001	Pass	
Mercury			mg/L	< 0.0001			0.0001	Pass	
Mercury (filtered)			mg/L	< 0.0001			0.0001	Pass	
Nickel			mg/L	< 0.001			0.001	Pass	
Nickel (filtered)			mg/L	< 0.001			0.001	Pass	
Zinc			mg/L	< 0.005			0.005	Pass	
Zinc (filtered)			mg/L	< 0.005			0.005	Pass	
LCS - % Recovery									
Heavy Metals									
Arsenic			%	101			80-120	Pass	
Arsenic (filtered)			%	96			80-120	Pass	
Cadmium			%	102			80-120	Pass	
Cadmium (filtered)			%	95			80-120	Pass	
Chromium			%	100			80-120	Pass	
Chromium (filtered)			%	95			80-120	Pass	
Copper			%	97			80-120	Pass	
Copper (filtered)			%	94			80-120	Pass	
Lead			%	100			80-120	Pass	
Lead (filtered)			%	96			80-120	Pass	
Mercury			%	108			80-120	Pass	
Mercury (filtered)			%	102			80-120	Pass	
Nickel			%	97			80-120	Pass	
Nickel (filtered)			%	96			80-120	Pass	
Zinc			%	100			80-120	Pass	
Zinc (filtered)			%	94			80-120	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S23-No0029281	CP	%	98			75-125	Pass	
Cadmium	S23-No0029281	CP	%	95			75-125	Pass	
Chromium	S23-No0029281	CP	%	102			75-125	Pass	
Copper	S23-No0029281	CP	%	100			75-125	Pass	
Lead	S23-No0029281	CP	%	102			75-125	Pass	
Mercury	S23-No0029281	CP	%	107			75-125	Pass	
Nickel	S23-No0029281	CP	%	98			75-125	Pass	
Zinc	S23-No0029281	CP	%	98			75-125	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic (filtered)	S23-No0026691	NCP	%	99			75-125	Pass	
Cadmium (filtered)	S23-No0026691	NCP	%	91			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Chromium (filtered)	S23-No0026691	NCP	%	92			75-125	Pass	
Copper (filtered)	S23-No0026691	NCP	%	88			75-125	Pass	
Lead (filtered)	S23-No0026691	NCP	%	90			75-125	Pass	
Mercury (filtered)	S23-No0026691	NCP	%	93			75-125	Pass	
Nickel (filtered)	S23-No0026691	NCP	%	89			75-125	Pass	
Zinc (filtered)	S23-No0026691	NCP	%	90			75-125	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S23-No0026691	NCP	mg/L	0.008	0.007	14	30%	Pass	
Cadmium	S23-No0026691	NCP	mg/L	0.0005	0.0004	24	30%	Pass	
Chromium	S23-No0026691	NCP	mg/L	0.021	0.021	<1	30%	Pass	
Copper	S23-No0026691	NCP	mg/L	0.019	0.019	1.6	30%	Pass	
Lead	S23-No0026691	NCP	mg/L	0.007	0.007	2.9	30%	Pass	
Mercury	S23-No0026691	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel	S23-No0026691	NCP	mg/L	0.005	0.005	3.1	30%	Pass	
Zinc	S23-No0026691	NCP	mg/L	0.021	0.020	6.6	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic (filtered)	S23-No0026674	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium (filtered)	S23-No0035914	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium (filtered)	S23-No0026674	NCP	mg/L	0.001	0.001	<1	30%	Pass	
Copper (filtered)	S23-No0026674	NCP	mg/L	0.001	0.002	36	30%	Fail	Q15
Lead (filtered)	S23-No0026674	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Mercury (filtered)	S23-No0026674	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel (filtered)	S23-No0026674	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Zinc (filtered)	S23-No0026674	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	

Comments
Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Ursula Long	Analytical Services Manager
Fang Yee Tan	Senior Analyst-Metal
Mickael Ros	Senior Analyst-Metal



Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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CHAIN OF CUSTODY

ALS Laboratory:
please tick →

HT

Subcon / Forward Lab / Split WO

Lab / Analysis: SWDUP2 - Euron

Relinquished By / Date:

Relinquished By / Date:

CLIENT: GHD Pty Ltd	TURNAROUND REQUIREMENT ☐ Standard TAT (List due date)		Connect / Courier: <u>STANDARD TAT</u>	FOR LABORATORY USE ONLY (Circle)	
OFFICE: Sydney	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Non Standard or under		WON List due date:	Custody Seal Int	No N/A
PROJECT: M12 Surface Water	ALS QUOTE NO.: SY/322/21	Attached By PO / Internal Sheet:	COC SEQUENCE NUMBER (Circle)	Free Ice / freezer	Environmental Division Sydney Work Order Reference ES2342516
ORDER NUMBER: 12554717			COC: 1 2 3 4 5 6 7	Random Sample	
PROJECT MANAGER: Henry Luo	CONTACT PH: Henry Luo 0414 090 002		OF: 1 2 3 4 5 6 7	Other comment	
SAMPLER: Emily Smith, Andrew Duval	SAMPLER MOBILE: 0431 522 928	RELINQUISHED BY: Andrew Duval (GHD)	RECEIVED BY: <u>mary</u>	RELINQUISHED BY:	
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): ESDAT	DATE/TIME: 6/12/2023 - 5pm	DATE/TIME: <u>8/12 5:49 PM</u>	DATE/TIME:	
Email Reports to: emily.smith@ghd.com; henry.luo@ghd.com; andrew.duval@ghd.com; esdat+ghd_au@esdatlabsync.net					
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Please keep M12 Groundwater as a separate workorder to M12 Surface Water as per the					



Telephone : + 61-2-8784 8555

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be Where Metals are required, specify Total (unfiltered bottle required) or Diss													
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	Comments	TOTAL CONTAINERS	Wet / 100% metals	Wet / 100% metals	Wet / 100% metals	Wet / 100% metals	Wet / 100% metals	Wet / 100% metals	Wet / 100% metals	Wet / 100% metals	Wet / 100% metals	Wet / 100% metals	Wet / 100% metals	Wet / 100% metals	Wet / 100% metals	Wet / 100% metals
1	BADDS	6/12/2023	Water		11	X	X	X	X	X					X				
2	BADMS	6/12/2023	Water		11	X	X	X	X	X					X				
3	BADUS	6/12/2023	Water		11	X	X	X	X	X					X				
4	COSDS	6/12/2023	Water		11	X	X	X	X	X					X				
5	COSUS	6/12/2023	Water		11	X	X	X	X	X					X				
6	HINDS	5/12/2023	Water		11	X	X	X	X	X					X				
7	HINUS	5/12/2023	Water		11	X	X	X	X	X					X				
8	KEMDS	5/12/2023	Water		11	X	X	X	X	X					X				
9	KEMUS	5/12/2023	Water		11	X	X	X	X	X					X				
10	ROPDS	5/12/2023	Water		11	X	X	X	X	X					X				
11	ROPUS	5/12/2023	Water		11	X	X	X	X	X					X				
12	SOUDS	5/12/2023	Water		11	X	X	X	X	X					X				
13	SOHUS	5/12/2023	Water		11	X	X	X	X	X					X				
14	SWDUP1	5/12/2023	Water		1	X													
X	SWDUP2	6/12/2023	Water		1														

1052 387

CHAIN OF CUSTODY RECORD

CLIENT DETAILS

Page 1 of 1

Company Name : GHD Pty Ltd, Sydney	Contact Name : Emily Smith 0911 522 688	Purchase Order : 13564111	COC Number :
Office Address :	Project Manager: Henry Luo 0414 090 002	PROJECT Number: 135471	Eurofins mgt quote ID :
Level #: 100 (Sydney) (Sydney) NSW 2000	Email for results : emily.smith@ghd.com; henry.luo@ghd.com; andrew.duval@ghd.com; esdat+ghd_au@esdatlabsync.net	PROJECT Name : M12 Water Sampling	Data output format: ESDAT

Special Directions & Comments :				Analytes						Some common holding times (with correct preservation). For further information contact the lab															
										Waters				Soils											
Sent from ALB										BTEX, MAH, VOC				14 days											
										TRH, PAH, Phenols, Pesticides				7 days				BTEX, MAH, VOC				14 days			
										Heavy Metals				6 months				TRH, PAH, Phenols, Pesticides				14 days			
										Mercury, CrVI				28 days				Heavy Metals				6 months			
										Microbiological testing				24 hours				Mercury, CrVI				28 days			
										BOD, Nitrate, Nitrite, Total N				2 days				Microbiological testing				72 hours			
										Solids - TSS, TDS etc				7 days				Anions				28 days			
										Ferrous iron				7 days				SPOCAS, pH Field and FOX, CrS				24 hours			
Eurofins mgt DI water batch number:										ASLP, TCLP				7 days											

	Sample ID	Date	Matrix	Diluted matrix	Total metals	Containers:								Sample comments:		
						500P	250P	60P	1LA	40mL vial	200mL A	Jar	Bag			
1	SWD001	2023/06/12	Water		X											
2	SWD002	2023/06/12	Water	X												
3																
4																
5																
6																
7																
8																
9																
10																

Relinquished By: Andrew Duval		Received By:		Method Of Shipment		Temperature on arrival:
Date & Time : 6/12/2023 - 5pm		Date & Time :		☐ Courier ☐ Hand Delivered ☐ Postal ☐ Courier Consignment # :		Report number:
Signature:		Signature:				

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 T: +61 7 3902 4600 +61 2 4968 8448 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

Eurofins ARL Pty Ltd

ABN: 91 05 0159 898

Perth
46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370

Eurofins Environment Testing NZ Ltd

NZBN: 9429046024954

Auckland	Auckland (Asb)	Christchurch	Tauranga
35 O'Rourke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	1277 Cameron Road, Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402

Sample Receipt Advice

Company name: GHD Pty Ltd NSW
Contact name: Henry Luo
Project name: M12 SURFACE WATER
Project ID: 12554717
Turnaround time: 5 Day
Date/Time received: Dec 8, 2023 5:49 PM
Eurofins reference: 1052387

Sample Information

- ✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ Sample Temperature of chilled sample on the batch as recorded by Eurofins Sample Receipt : 5.1 degrees Celsius.
- ✓ All samples have been received as described on the above COC.
- ✓ COC has been completed correctly.
- ✓ Attempt to chill was evident.
- ✓ Appropriately preserved sample containers have been used.
- ✓ All samples were received in good condition.
- ✓ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ✓ Appropriate sample containers have been used.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Samples received by the laboratory after 5.30pm are deemed to have been received the following working day.

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Bonnie Pu on phone : or by email: BonniePu@eurofins.com

Results will be delivered electronically via email to Henry Luo - henry.luo@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd NSW email address.



web: www.eurofins.com.au
email: EnviroSales@eurofins.com

ABN: 50 005 085 521

Melbourne 6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	Geelong 19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	Sydney 179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Canberra Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	Brisbane 1/21 Smallwood Place Murarie QLD 4172 T: +61 7 3902 4600 NATA# 1261 Site# 20794	Newcastle 1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

ABN: 91 05 0159 898

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NZBN: 9429046024954

Auckland 35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Auckland (Asb) Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	Tauranga 1277 Cameron Road, Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402

Company Name: GHD Pty Ltd NSW
Address: Level 15, 133 Castlereagh Street
Sydney
NSW 2000

Project Name: M12 SURFACE WATER
Project ID: 12554717

Order No.:
Report #: 1052387
Phone: 02 9239 7100
Fax: 02 9239 7199

Received: Dec 8, 2023 5:49 PM
Due: Dec 15, 2023
Priority: 5 Day
Contact Name: Henry Luo

Eurofins Analytical Services Manager : Bonnie Pu

Sample Detail						Metals M8	Metals M8 filtered
							X
						X	X
External Laboratory							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	SWDUP2	Dec 05, 2023		Water	S23-De0021771	X	
2	GWDUP2	Dec 06, 2023		Water	S23-De0021772		X
Test Counts						1	1

GHD Pty Ltd NSW
Level 15, 133 Castlereagh Street
Sydney
NSW 2000



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition
Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection, proficiency testing scheme providers and
reference materials producers reports and certificates.

Attention: Henry Luo

Report 1052387-W
Project name M12 SURFACE WATER
Project ID 12554717
Received Date Dec 08, 2023

Client Sample ID			SWDUP2	GWDUP2
Sample Matrix			Water	Water
Eurofins Sample No.			S23-De0021771	S23-De0021772
Date Sampled			Dec 05, 2023	Dec 06, 2023
Test/Reference	LOR	Unit		
Heavy Metals				
Arsenic	0.001	mg/L	0.003	-
Arsenic (filtered)	0.001	mg/L	-	< 0.001
Cadmium	0.0002	mg/L	< 0.0002	-
Cadmium (filtered)	0.0002	mg/L	-	< 0.0002
Chromium	0.001	mg/L	0.002	-
Chromium (filtered)	0.001	mg/L	-	< 0.001
Copper	0.001	mg/L	0.004	-
Copper (filtered)	0.001	mg/L	-	0.002
Lead	0.001	mg/L	0.003	-
Lead (filtered)	0.001	mg/L	-	< 0.001
Mercury	0.0001	mg/L	< 0.0001	-
Mercury (filtered)	0.0001	mg/L	-	< 0.0001
Nickel	0.001	mg/L	0.002	-
Nickel (filtered)	0.001	mg/L	-	0.002
Zinc	0.005	mg/L	0.006	-
Zinc (filtered)	0.005	mg/L	-	0.007

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Metals M8	Sydney	Dec 14, 2023	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Metals M8 filtered	Sydney	Dec 14, 2023	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			



Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarie QLD 4172 T: +61 7 3902 4600 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

Perth
46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370

Auckland	Auckland (Asb)	Christchurch	Tauranga
35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	1277 Cameron Road, Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402

Company Name:	GHD Pty Ltd NSW	Order No.:		Received:	Dec 8, 2023 5:49 PM
Address:	Level 15, 133 Castlereagh Street Sydney NSW 2000	Report #:	1052387	Due:	Dec 15, 2023
		Phone:	02 9239 7100	Priority:	5 Day
		Fax:	02 9239 7199	Contact Name:	Henry Luo
Project Name:	M12 SURFACE WATER				
Project ID:	12554717				
Eurofins Analytical Services Manager : Bonnie Pu					

Sample Detail						Metals M8	Metals M8 filtered
Melbourne Laboratory - NATA # 1261 Site # 1254							X
Sydney Laboratory - NATA # 1261 Site # 18217						X	X
External Laboratory							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	SWDUP2	Dec 05, 2023		Water	S23-De0021771	X	
2	GWDUP2	Dec 06, 2023		Water	S23-De0021772		X
Test Counts						1	1

Internal Quality Control Review and Glossary

General

- Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follow guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013. They are included in this QC report where applicable. Additional QC data may be available on request.
- All soil/sediment/solid results are reported on a dry weight basis unless otherwise stated.
- All biota/food results are reported on a wet weight basis on the edible portion unless otherwise stated.
- For CEC results where the sample's origin is unknown or environmentally contaminated, the results should be used advisedly.
- Actual LORs are matrix dependent. Quoted LORs may be raised where sample extracts are diluted due to interferences.
- Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
- SVOC analysis on waters is performed on homogenised, unfiltered samples unless noted otherwise.
- Samples were analysed on an 'as received' basis.
- Information identified in this report with **blue** colour indicates data provided by customers that may have an impact on the results.
- This report replaces any interim results previously issued.

Holding Times

Please refer to the 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours before sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and despite any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling; therefore, compliance with these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether, the holding time is 7 days; however, for all other VOCs, such as BTEX or C6-10 TRH, the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ppm: parts per million
µg/L: micrograms per litre	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit	Colour: Pt-Co Units	

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples, these are performed on laboratory-certified clean sands and in the case of water samples, these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
TBTO	Tributyltin oxide (<i>bis</i> -tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however, free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should only be used as a guide and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is ≤30%; however, the following acceptance guidelines are equally applicable:

Results <10 times the LOR:	No Limit
Results between 10-20 times the LOR:	RPD must lie between 0-50%
Results >20 times the LOR:	RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%, VOC recoveries 70 – 130%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 5.4, where no positive PFAS results have been reported or reviewed, and no data was affected.

QC Data General Comments

- Where a result is reported as less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
- Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown are not data from your samples.
- pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
- Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
- For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
- Duplicate RPDs are calculated from raw analytical data; thus, it is possible to have two sets of data.

Quality Control Results

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank									
Heavy Metals									
Arsenic			mg/L	< 0.001			0.001	Pass	
Arsenic (filtered)			mg/L	< 0.001			0.001	Pass	
Cadmium			mg/L	< 0.0002			0.0002	Pass	
Cadmium (filtered)			mg/L	< 0.0002			0.0002	Pass	
Chromium			mg/L	< 0.001			0.001	Pass	
Chromium (filtered)			mg/L	< 0.001			0.001	Pass	
Copper			mg/L	< 0.001			0.001	Pass	
Copper (filtered)			mg/L	< 0.001			0.001	Pass	
Lead			mg/L	< 0.001			0.001	Pass	
Lead (filtered)			mg/L	< 0.001			0.001	Pass	
Mercury			mg/L	< 0.0001			0.0001	Pass	
Mercury (filtered)			mg/L	< 0.0001			0.0001	Pass	
Nickel			mg/L	< 0.001			0.001	Pass	
Nickel (filtered)			mg/L	< 0.001			0.001	Pass	
Zinc			mg/L	< 0.005			0.005	Pass	
Zinc (filtered)			mg/L	< 0.005			0.005	Pass	
LCS - % Recovery									
Heavy Metals									
Arsenic			%	89			80-120	Pass	
Arsenic (filtered)			%	92			80-120	Pass	
Cadmium			%	87			80-120	Pass	
Cadmium (filtered)			%	92			80-120	Pass	
Chromium			%	88			80-120	Pass	
Chromium (filtered)			%	90			80-120	Pass	
Copper			%	88			80-120	Pass	
Copper (filtered)			%	89			80-120	Pass	
Lead			%	87			80-120	Pass	
Lead (filtered)			%	91			80-120	Pass	
Mercury			%	94			80-120	Pass	
Mercury (filtered)			%	99			80-120	Pass	
Nickel			%	88			80-120	Pass	
Nickel (filtered)			%	88			80-120	Pass	
Zinc			%	87			80-120	Pass	
Zinc (filtered)			%	89			80-120	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S23-De0021771	CP	%	94			75-125	Pass	
Cadmium	S23-De0021771	CP	%	89			75-125	Pass	
Chromium	S23-De0021771	CP	%	88			75-125	Pass	
Copper	S23-De0021771	CP	%	85			75-125	Pass	
Lead	S23-De0021771	CP	%	86			75-125	Pass	
Mercury	S23-De0021771	CP	%	96			75-125	Pass	
Nickel	S23-De0021771	CP	%	86			75-125	Pass	
Zinc	S23-De0021771	CP	%	85			75-125	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic (filtered)	S23-De0024809	NCP	%	86			75-125	Pass	
Cadmium (filtered)	S23-De0024809	NCP	%	88			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Chromium (filtered)	S23-De0024809	NCP	%	84			75-125	Pass	
Copper (filtered)	S23-De0024809	NCP	%	83			75-125	Pass	
Lead (filtered)	S23-De0024809	NCP	%	84			75-125	Pass	
Mercury (filtered)	S23-De0013499	NCP	%	92			75-125	Pass	
Nickel (filtered)	S23-De0024809	NCP	%	83			75-125	Pass	
Zinc (filtered)	S23-De0024809	NCP	%	82			75-125	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S23-De0019009	NCP	mg/L	0.004	0.004	3.7	30%	Pass	
Cadmium	S23-De0019009	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium	S23-De0019009	NCP	mg/L	0.002	0.002	3.7	30%	Pass	
Copper	S23-De0019009	NCP	mg/L	0.003	0.003	<1	30%	Pass	
Lead	S23-De0019009	NCP	mg/L	0.004	0.004	3.4	30%	Pass	
Mercury	S23-De0016640	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel	S23-De0019009	NCP	mg/L	0.007	0.007	3.9	30%	Pass	
Zinc	S23-De0019009	NCP	mg/L	0.012	0.013	1.9	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic (filtered)	S23-De0021772	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium (filtered)	S23-De0021772	CP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium (filtered)	S23-De0021772	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper (filtered)	S23-De0021772	CP	mg/L	0.002	0.002	6.3	30%	Pass	
Lead (filtered)	S23-De0021772	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Mercury (filtered)	S23-De0021772	CP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel (filtered)	S23-De0021772	CP	mg/L	0.002	0.002	8.3	30%	Pass	
Zinc (filtered)	S23-De0021772	CP	mg/L	0.007	0.007	2.6	30%	Pass	

Comments
Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Ursula Long	Analytical Services Manager
Fang Yee Tan	Senior Analyst-Metal
Mickael Ros	Senior Analyst-Metal



Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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Email: enquiries.melb@mgllabmark.com.au

CHAIN OF CUSTODY RECORD

CLIENT DETAILS										Page 1 of 1						
Company Name : GHD				Contact Name : Emily Smith 0431 522 326				Purchase Order : 12554717		COC Number :						
Office Address :				Project Manager: Henry Luo 0214 094 062				PROJECT Number : 12554717		Eurofins mgt quote ID :						
				Email for results : emily.smith@ghd.com; andrew.duval@ghd.com; henry.luo@ghd.com; ghdlabmark@outlook.com				PROJECT Name : M42 Water Sampling		Data output format: ESDAT						
Special Directions & Comments :				Analytes				Some common holding times (with correct preservation), For further information contact the lab								
								Waters		Soils						
								BTEX, MAH, VOC	14 days	BTEX, MAH, VOC	14 days					
								TRH, PAH, Phenols, Pesticides	7 days	TRH, PAH, Phenols, Pesticides	14 days					
								Heavy Metals	6 months	Heavy Metals	6 months					
								Mercury, CrVI		28 days	Mercury, CrVI	28 days				
								Microbiological testing		24 hours	Microbiological testing	72 hours				
								BOD, Nitrate, Nitrite, Total N		2 days	Anions	28 days				
								Solids - TSS, TDS etc		7 days	SPOCAS, pH Field and FOX, CrS	24 hours				
								Ferrous iron		7 days	ASLP, TCLP	7 days				
Eurofins mgt DI water batch number:								Containers:				Sample comments:				
Sample ID		Date		Matrix				500P	250P	60P	1LA	40mL vial	200mL A	Jar	Beg	
1		19-01-2024		Water						1						
2		19-01-2024		Water						1						
3																
4																
5																
6																
7																
8																
9																
10																
Relinquished By:				Received By:				Method Of Shipment				Temperature on arrival:				
Andrew Duval - GHD								☐ Courier ☐ Hand Delivered ☐ Postal								
Date & Time :				Date & Time :				Courier Consignment # :				Report number:				
19-01-2024																
Signature:				Signature:												
A Duval																

1061811

Relinquished By / Date: _____

H



CHAIN OF CUSTODY

ALS Laboratory:
please tick →

VG No:

Attached By: PO - Internal:Shree

Printed by: BQ-7 Internal Sheet

[illegible]

CLIENT: 0415 Big Loo		TURNAROUND REQUIREMENT: ☐ Standard TAT (List due date):		STANDARD TAT		FOR LABORATORY USE ONLY (Circle)	
OFFICE: 0415 Big Loo		(Standard TAT may be longer for some tests e.g., Ultra Trace) ☐ Non Standard or urgent TAT (List due date):				Custody Seal Intact? Yes No	
PROJECT: M12 Groundwater		ALS QUOTE NO.: 0415 Big Loo		COC SEQUENCE NUMBER (Circle)		Free ice / frozen ice bricks present upon receipt? Yes No	
ORDER NUMBER: 12554717				COC: 1 2 3 4 5 6 7		Random Sample Temperature on Receipt: 6.8 °C	
PROJECT MANAGER: Henry Luo		CONTACT PH: Henry Luo 0414 090 002		OF: 1 2 3 4 5 6 7		Other comment:	
SAMPLER: Emily Smith, Andrew Duval		SAMPLER MOBILE: 0431 522 929		RELINQUISHED BY:		RELINQUISHED BY:	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default): EDS		Andrew Duval - GHD		RECEIVED BY: Andrew Duval	
Email Reports to: 0415 Big Loo		DATE/TIME: 19-01-2024		DATE/TIME: 19/1/24 1718		DATE/TIME: 22/1/24 1718	

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

PLEASE DO NOT LOG ALL SAMPLES RECEIVED IN ONE WORKORDER. LOG AS TWO SEPARATE WORKORDERS AS PER THE TWO CO PROVIDED.

ALS USE		SAMPLE DETAILS		CONTAINER INFORMATION		ANALYSIS REQUIRED Including SUITES (NB, Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).																					
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	Comments	TOTAL CONTAINERS	As (ppm) - Total	Barium (ppm) - Total	Boron (ppm) - Total	Bromine (ppm) - Total	Cadmium (ppm) - Total	Calcium (ppm) - Total	Chloride (ppm) - Total	Cobalt (ppm) - Total	Copper (ppm) - Total	Fluoride (ppm) - Total	Iron (ppm) - Total	Manganese (ppm) - Total	Mercury (ppm) - Total	Nickel (ppm) - Total	Phosphorus (ppm) - Total	Potassium (ppm) - Total	Selenium (ppm) - Total	Silver (ppm) - Total	Sulfate (ppm) - Total	Sulfur (ppm) - Total	Titanium (ppm) - Total	Zinc (ppm) - Total
1	BH-0086	15/01/2024	Water		5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	BH-078	18/01/2024	Water		6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3	BH-102P	15/01/2024	Water		6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4	BH-128F	15/01/2024	Water		6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5	BH-018P	15/01/2024	Water		5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	BH-010C	15/01/2024	Water	In-line filter used on backwash from attached pier.	5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6	BH-009P	19/01/2024	Water		5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
7	BH-0086	15/01/2024	Water		5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
8	BH-blank	15/01/2024	Water		5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Environmental Division
Sydney
Work Order Reference
ES2401985



Environmental Division
Sydney

Work Order Reference

Work Order Reference
ES2401985



Telephone : + 61-2-8784 8555

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 T: +61 7 3902 4600 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

Eurofins ARL Pty Ltd

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Perth
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Eurofins Environment Testing NZ Ltd

NZBN: 9429046024954

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Sample Receipt Advice

Company name: GHD Pty Ltd NSW
Contact name: Henry Luo
Project name: M12 WATER SAMPLING
Project ID: 12554717
Turnaround time: 5 Day
Date/Time received: Jan 22, 2024 2:35 PM
Eurofins reference: 1061811

Sample Information

- ✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ Sample Temperature of chilled sample on the batch as recorded by Eurofins Sample Receipt : 6.8 degrees Celsius.
- ✓ All samples have been received as described on the above COC.
- ✓ COC has been completed correctly.
- ✓ Attempt to chill was evident.
- ✓ Appropriately preserved sample containers have been used.
- ✓ All samples were received in good condition.
- ✓ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ✓ Appropriate sample containers have been used.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Bonnie Pu on phone : or by email: BonniePu@eurofins.com

Results will be delivered electronically via email to Henry Luo - henry.luo@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd NSW email address.



web: www.eurofins.com.au
email: EnviroSales@eurofins.com

ABN: 50 005 085 521

Melbourne 6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	Geelong 19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	Sydney 179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Canberra Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	Brisbane 1/21 Smallwood Place Murarie QLD 4172 T: +61 7 3902 4600 NATA# 1261 Site# 20794	Newcastle 1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

ABN: 91 05 0159 898

Perth 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370

NZBN: 9429046024954

Auckland 35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Auckland (Asb) Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	Tauranga 1277 Cameron Road, Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402

Company Name: GHD Pty Ltd NSW
Address: Level 15, 133 Castlereagh Street
Sydney
NSW 2000

Project Name: M12 WATER SAMPLING
Project ID: 12554717

Order No.:
Report #: 1061811
Phone: 02 9239 7100
Fax: 02 9239 7199

Received: Jan 22, 2024 2:35 PM
Due: Jan 30, 2024
Priority: 5 Day
Contact Name: Henry Luo

Eurofins Analytical Services Manager : Bonnie Pu

Sample Detail						Metals M8	Metals M8 filtered
						X	X
Sydney Laboratory - NATA # 1261 Site # 18217							
External Laboratory							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	GWDUP2	Jan 19, 2024		Water	S24-Ja0033834		X
2	SWDUP2	Jan 19, 2024		Water	S24-Ja0033835	X	
Test Counts						1	1

GHD Pty Ltd NSW
Level 15, 133 Castlereagh Street
Sydney
NSW 2000



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition
Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection, proficiency testing scheme providers and
reference materials producers reports and certificates.

Attention: Henry Luo

Report 1061811-W
Project name M12 WATER SAMPLING
Project ID 12554717
Received Date Jan 22, 2024

Client Sample ID			GWDUP2	SWDUP2
Sample Matrix			Water	Water
Eurofins Sample No.			S24-Ja0033834	S24-Ja0033835
Date Sampled			Jan 19, 2024	Jan 19, 2024
Test/Reference	LOR	Unit		
Heavy Metals				
Arsenic	0.001	mg/L	-	0.002
Arsenic (filtered)	0.001	mg/L	0.003	-
Cadmium	0.0002	mg/L	-	< 0.0002
Cadmium (filtered)	0.0002	mg/L	< 0.0002	-
Chromium	0.001	mg/L	-	0.002
Chromium (filtered)	0.001	mg/L	< 0.001	-
Copper	0.001	mg/L	-	0.006
Copper (filtered)	0.001	mg/L	< 0.001	-
Lead	0.001	mg/L	-	0.002
Lead (filtered)	0.001	mg/L	< 0.001	-
Mercury	0.0001	mg/L	-	< 0.0001
Mercury (filtered)	0.0001	mg/L	< 0.0001	-
Nickel	0.001	mg/L	-	0.003
Nickel (filtered)	0.001	mg/L	< 0.001	-
Zinc	0.005	mg/L	-	0.013
Zinc (filtered)	0.005	mg/L	< 0.005	-

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Metals M8 - Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS	Sydney	Jan 24, 2024	28 Days
Metals M8 filtered - Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS	Sydney	Jan 24, 2024	28 Days



web: www.eurofins.com.au
email: EnviroSales@eurofins.com

ABN: 50 005 085 521					
Melbourne 6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	Geelong 19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	Sydney 179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Canberra Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	Brisbane 1/21 Smallwood Place Murarie QLD 4172 T: +61 7 3902 4600 NATA# 1261 Site# 20794	Newcastle 1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

ABN: 91 05 0159 898		NZBN: 9429046024954		
Perth 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370	Auckland 35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Auckland (Asb) Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	Tauranga 1277 Cameron Road, Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402

Company Name:	GHD Pty Ltd NSW	Order No.:		Received:	Jan 22, 2024 2:35 PM
Address:	Level 15, 133 Castlereagh Street Sydney NSW 2000	Report #:	1061811	Due:	Jan 30, 2024
		Phone:	02 9239 7100	Priority:	5 Day
		Fax:	02 9239 7199	Contact Name:	Henry Luo
Project Name:	M12 WATER SAMPLING				
Project ID:	12554717				
Eurofins Analytical Services Manager : Bonnie Pu					

Sample Detail						Metals M8	Metals M8 filtered
						X	X
Sydney Laboratory - NATA # 1261 Site # 18217							
External Laboratory							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	GWDUP2	Jan 19, 2024		Water	S24-Ja0033834		X
2	SWDUP2	Jan 19, 2024		Water	S24-Ja0033835	X	
Test Counts						1	1

Internal Quality Control Review and Glossary

General

- Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follow guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013. They are included in this QC report where applicable. Additional QC data may be available on request.
- All soil/sediment/solid results are reported on a dry weight basis unless otherwise stated.
- All biota/food results are reported on a wet weight basis on the edible portion unless otherwise stated.
- For CEC results where the sample's origin is unknown or environmentally contaminated, the results should be used advisedly.
- Actual LORs are matrix dependent. Quoted LORs may be raised where sample extracts are diluted due to interferences.
- Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
- SVOC analysis on waters is performed on homogenised, unfiltered samples unless noted otherwise.
- Samples were analysed on an 'as received' basis.
- Information identified in this report with **blue** colour indicates data provided by customers that may have an impact on the results.
- This report replaces any interim results previously issued.

Holding Times

Please refer to the 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours before sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and despite any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling; therefore, compliance with these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether, the holding time is 7 days; however, for all other VOCs, such as BTEX or C6-10 TRH, the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ppm: parts per million
µg/L: micrograms per litre	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit	Colour: Pt-Co Units	

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples, these are performed on laboratory-certified clean sands and in the case of water samples, these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
TBTO	Tributyltin oxide (<i>bis</i> -tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however, free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should only be used as a guide and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is ≤30%; however, the following acceptance guidelines are equally applicable:

Results <10 times the LOR:	No Limit
Results between 10-20 times the LOR:	RPD must lie between 0-50%
Results >20 times the LOR:	RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%, VOC recoveries 70 – 130%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 5.4, where no positive PFAS results have been reported or reviewed, and no data was affected.

QC Data General Comments

- Where a result is reported as less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
- Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown are not data from your samples.
- pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
- Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
- For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
- Duplicate RPDs are calculated from raw analytical data; thus, it is possible to have two sets of data.

Quality Control Results

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank									
Heavy Metals									
Arsenic			mg/L	< 0.001			0.001	Pass	
Arsenic (filtered)			mg/L	< 0.001			0.001	Pass	
Cadmium			mg/L	< 0.0002			0.0002	Pass	
Cadmium (filtered)			mg/L	< 0.0002			0.0002	Pass	
Chromium			mg/L	< 0.001			0.001	Pass	
Chromium (filtered)			mg/L	< 0.001			0.001	Pass	
Copper			mg/L	< 0.001			0.001	Pass	
Copper (filtered)			mg/L	< 0.001			0.001	Pass	
Lead			mg/L	< 0.001			0.001	Pass	
Lead (filtered)			mg/L	< 0.001			0.001	Pass	
Mercury			mg/L	< 0.0001			0.0001	Pass	
Mercury (filtered)			mg/L	< 0.0001			0.0001	Pass	
Nickel			mg/L	< 0.001			0.001	Pass	
Nickel (filtered)			mg/L	< 0.001			0.001	Pass	
Zinc			mg/L	< 0.005			0.005	Pass	
Zinc (filtered)			mg/L	< 0.005			0.005	Pass	
LCS - % Recovery									
Heavy Metals									
Arsenic			%	82			80-120	Pass	
Arsenic (filtered)			%	97			80-120	Pass	
Cadmium			%	82			80-120	Pass	
Cadmium (filtered)			%	97			80-120	Pass	
Chromium			%	88			80-120	Pass	
Chromium (filtered)			%	99			80-120	Pass	
Copper			%	88			80-120	Pass	
Copper (filtered)			%	101			80-120	Pass	
Lead			%	86			80-120	Pass	
Lead (filtered)			%	97			80-120	Pass	
Mercury			%	92			80-120	Pass	
Mercury (filtered)			%	97			80-120	Pass	
Nickel			%	87			80-120	Pass	
Nickel (filtered)			%	101			80-120	Pass	
Zinc			%	85			80-120	Pass	
Zinc (filtered)			%	101			80-120	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic (filtered)	S24-Ja0033821	NCP	%	95			75-125	Pass	
Cadmium (filtered)	S24-Ja0033821	NCP	%	100			75-125	Pass	
Chromium (filtered)	S24-Ja0033821	NCP	%	95			75-125	Pass	
Copper (filtered)	S24-Ja0033821	NCP	%	97			75-125	Pass	
Lead (filtered)	S24-Ja0033821	NCP	%	94			75-125	Pass	
Nickel (filtered)	S24-Ja0033821	NCP	%	97			75-125	Pass	
Zinc (filtered)	S24-Ja0033821	NCP	%	96			75-125	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S24-Ja0026117	NCP	%	82			75-125	Pass	
Cadmium	S24-Ja0026117	NCP	%	81			75-125	Pass	
Chromium	S24-Ja0026117	NCP	%	91			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Copper	S24-Ja0026117	NCP	%	93			75-125	Pass	
Lead	S24-Ja0026117	NCP	%	87			75-125	Pass	
Mercury	S24-Ja0026117	NCP	%	96			75-125	Pass	
Nickel	S24-Ja0026117	NCP	%	88			75-125	Pass	
Zinc	S24-Ja0026117	NCP	%	83			75-125	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic (filtered)	W24-Ja0022835	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium (filtered)	W24-Ja0022835	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium (filtered)	W24-Ja0022835	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper (filtered)	W24-Ja0022835	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Lead (filtered)	W24-Ja0022835	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Mercury (filtered)	W24-Ja0022835	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel (filtered)	W24-Ja0022835	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Zinc (filtered)	W24-Ja0022835	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S24-Ja0031868	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium	W24-Ja0028902	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium	S24-Ja0031868	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper	W24-Ja0022835	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Lead	S24-Ja0031868	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Mercury	S24-Ja0031868	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel	W24-Ja0022835	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Zinc	S24-Ja0031868	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	

Comments
Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Ursula Long	Analytical Services Manager
Fang Yee Tan	Senior Analyst-Metal
Mickael Ros	Senior Analyst-Metal



Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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1069861

Subcon / Forward Lab / Split WO
Lab / Analysis: *Environ - SWP21 updated*

Environmental Division
Sydney
Work Order Reference
ES2404913



CHAIN OF CUSTODY

ALS Laboratory
please tick →

Organised By / Date: _____
Relinquished By / Date: _____
Connote / Courier: _____



Telephone : +61-2-8784 8555

CLIENT: GHD Pty Ltd	WO No: TURNAROUND REQUIREMENT: ☐ Standard TAT (List due date): STANDARD TAT	FOR LABORATORY
OFFICE: Sydney	Attached by PO / Inertia Sheet: ☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact?
PROJECT: M12 Surface Water	ALS QUOTE NO.: 447567271	Free ice / frozen ice brick
ORDER NUMBER: 12064717		Random Sample Temp
PROJECT MANAGER: Henry Luo	CONTACT PH: Henry Luo 0451 001 002	Other comment
SAMPLER: Andrew Duval, Jackson Miller	SAMPLER MOBILE: 0468301344	RELINQUISHED BY:
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): ESDAT	DATE/TIME:
Email Reports to: emily.smith@ghd.com; andrew.duval@ghd.com; jackson.miller@ghd.com		RECEIVED BY: <i>John</i>
		DATE/TIME: 15/2/24 10:25

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:					IN CASE LOG ONLY LOG ALL TANK EFFLUENTS IN THE TWO COC PROVIDED.										AS					
ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).														
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	Comments	TOTAL CONTAINERS	SW 100% (100% SW)	SW 100% (100% SW)	SW 100% (100% SW)	SW 100% (100% SW)	SW 100% (100% SW)	SW 100% (100% SW)	SW 100% (100% SW)	SW 100% (100% SW)	SW 100% (100% SW)	SW 100% (100% SW)	SW 100% (100% SW)	SW 100% (100% SW)	SW 100% (100% SW)	SW 100% (100% SW)	
1	EADDS	13/02/2024	Water		11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	EADMS	13/02/2024	Water		11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3	EADUS	13/02/2024	Water		11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4	ESDS	13/02/2024	Water		11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5	ESUS	13/02/2024	Water		11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6	HINDS	14/02/2024	Water		11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
7	HINUS	14/02/2024	Water		11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
8	REMDS	14/02/2024	Water		11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
9	REMUS	14/02/2024	Water		11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
10	ROPDS	14/02/2024	Water		11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
11	ROPUS	14/02/2024	Water		11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
12	SOUDS	14/02/2024	Water		11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
13	SOUS	14/02/2024	Water		11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
14	SWDMS	13/02/2024	Water		11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	SWDUS	14/02/2024	Water		11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

☒ **Sydney**

Unit F3 - 6 Building F, 16 Mars Road, Lane Cove
 Phone: +612 9900 8400
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☐ **Brisbane**

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☐ **Melbourne**

2 Kingston Town Close, Oakleigh, VIC 3166
 Phone: +613 8564 5000 Fax: +613 8564 5090
 Email: enquiries.melb@mgflabmark.com.au

CHAIN OF CUSTODY RECORD

CLIENT DETAILS

Page 1 of 1

Company Name : GHD	Contact Name : Andrew Duval 0414 090 002	Purchase Order : 1255477	COC Number :
Office Address :	Project Manager: Henry Luo 0414 090 002	PROJECT Number : 1255477	Eurofins mgt quote ID :
Level 15,	Email for results : emily.smith@ghd.com; andrew.duval@ghd.com;	PROJECT Name : 1012 Water sampling	Data output format: ESDAT

Special Directions & Comments :			Analytes						Some common holding times (with correct preservation). For further information contact the lab									
									Waters					Soils				
Eurofins 1 mg/L DI water batch number:			Dissolved metals	Total metals					BTEX, MAH, VOC		14 days	BTEX, MAH, VOC		14 days				
									TRH, PAH, Phenols, Pesticides		7 days	TRH, PAH, Phenols, Pesticides		14 days				
									Heavy Metals		6 months	Heavy Metals		6 months				
									Mercury, CrVI		28 days	Mercury, CrVI		28 days				
									Microbiological testing		24 hours	Microbiological testing		72 hours				
									BOD, Nitrate, Nitrite, Total N		2 days	Anions		28 days				
									Solids - TSS, TDS etc		7 days	SPOCAS, pH Field and FOX, CrS		24 hours				
									Ferrous iron		7 days	ASLP, TCLP		7 days				
			Containers:										Sample comments:					
			500P	250P	60P	1LA	40mL vial	200mL A	Jar	Bag								
Sample ID	Date	Matrix																
1	2008-07-14	Water		X								1						
2	2008-07-14	Water	X									1						
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Relinquished By:		Received By:		Method Of Shipment		Temperature on arrival:	
Date & Time:		Date & Time:		☐ Courier ☐ Hand Delivered ☐ Postal Courier Consignment # :		Report number:	
Signature:		Signature:					

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 T: +61 7 3902 4600 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

Eurofins ARL Pty Ltd

ABN: 91 05 0159 898

Perth
46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370

Eurofins Environment Testing NZ Ltd

NZBN: 9429046024954

Auckland	Auckland (Asb)	Christchurch	Tauranga
35 O'Rourke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	1277 Cameron Road, Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402

Sample Receipt Advice

Company name:	GHD Pty Ltd NSW
Contact name:	Henry Luo
Project name:	M12 WATER SAMPLING
Project ID:	12554717
Turnaround time:	5 Day
Date/Time received	Feb 16, 2024 2:52 PM
Eurofins reference	1069861

Sample Information

- ✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ Sample Temperature of chilled sample on the batch as recorded by Eurofins Sample Receipt : 13.8 degrees Celsius.
- ✓ All samples have been received as described on the above COC.
- ✓ COC has been completed correctly.
- ✓ Attempt to chill was evident.
- ✓ Appropriately preserved sample containers have been used.
- ✓ All samples were received in good condition.
- ✓ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ✓ Appropriate sample containers have been used.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Bonnie Pu on phone : or by email: BonniePu@eurofins.com

Results will be delivered electronically via email to Henry Luo - henry.luo@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd NSW email address.



web: www.eurofins.com.au
email: EnviroSales@eurofins.com

ABN: 50 005 085 521					
Melbourne 6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	Geelong 19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	Sydney 179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Canberra Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	Brisbane 1/21 Smallwood Place Murarie QLD 4172 T: +61 7 3902 4600 NATA# 1261 Site# 20794	Newcastle 1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

ABN: 91 05 0159 898		NZBN: 9429046024954		
Perth 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370	Auckland 35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Auckland (Asb) Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	Tauranga 1277 Cameron Road, Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402

Company Name:	GHD Pty Ltd NSW	Order No.:		Received:	Feb 16, 2024 2:52 PM
Address:	Level 15, 133 Castlereagh Street Sydney NSW 2000	Report #:	1069861	Due:	Feb 23, 2024
		Phone:	02 9239 7100	Priority:	5 Day
		Fax:	02 9239 7199	Contact Name:	Henry Luo
Project Name:	M12 WATER SAMPLING				
Project ID:	12554717				
Eurofins Analytical Services Manager : Bonnie Pu					

Sample Detail						Metals M8	Metals M8 filtered
						X	X
Sydney Laboratory - NATA # 1261 Site # 18217							
External Laboratory							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	SWDUP2	Feb 14, 2024		Water	S24-Fe0044850	X	
2	GWDUP2	Feb 13, 2024		Water	S24-Fe0044851		X
Test Counts						1	1

GHD Pty Ltd NSW
Level 15, 133 Castlereagh Street
Sydney
NSW 2000



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition
Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection, proficiency testing scheme providers and
reference materials producers reports and certificates.

Attention: Henry Luo

Report 1069861-W
Project name M12 WATER SAMPLING
Project ID 12554717
Received Date Feb 16, 2024

Client Sample ID			SWDUP2	GWDUP2
Sample Matrix			Water	Water
Eurofins Sample No.			S24-Fe0044850	S24-Fe0044851
Date Sampled			Feb 14, 2024	Feb 13, 2024
Test/Reference	LOR	Unit		
Heavy Metals				
Arsenic	0.001	mg/L	0.002	-
Arsenic (filtered)	0.001	mg/L	-	< 0.001
Cadmium	0.0002	mg/L	< 0.0002	-
Cadmium (filtered)	0.0002	mg/L	-	< 0.0002
Chromium	0.001	mg/L	< 0.001	-
Chromium (filtered)	0.001	mg/L	-	< 0.001
Copper	0.001	mg/L	< 0.001	-
Copper (filtered)	0.001	mg/L	-	0.002
Lead	0.001	mg/L	< 0.001	-
Lead (filtered)	0.001	mg/L	-	< 0.001
Mercury	0.0001	mg/L	< 0.0001	-
Mercury (filtered)	0.0001	mg/L	-	< 0.0001
Nickel	0.001	mg/L	< 0.001	-
Nickel (filtered)	0.001	mg/L	-	< 0.001
Zinc	0.005	mg/L	0.007	-
Zinc (filtered)	0.005	mg/L	-	< 0.005

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Metals M8	Sydney	Feb 20, 2024	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Metals M8 filtered	Sydney	Feb 20, 2024	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			



web: www.eurofins.com.au
email: EnviroSales@eurofins.com

ABN: 50 005 085 521					
Melbourne 6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	Geelong 19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	Sydney 179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Canberra Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	Brisbane 1/21 Smallwood Place Murarie QLD 4172 T: +61 7 3902 4600 NATA# 1261 Site# 20794	Newcastle 1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

ABN: 91 05 0159 898		NZBN: 9429046024954	
Perth 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370	Auckland 35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Auckland (Asb) Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290
		Tauranga 1277 Cameron Road, Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402	

Company Name:	GHD Pty Ltd NSW	Order No.:		Received:	Feb 16, 2024 2:52 PM
Address:	Level 15, 133 Castlereagh Street Sydney NSW 2000	Report #:	1069861	Due:	Feb 23, 2024
		Phone:	02 9239 7100	Priority:	5 Day
		Fax:	02 9239 7199	Contact Name:	Henry Luo
Project Name:	M12 WATER SAMPLING				
Project ID:	12554717				
Eurofins Analytical Services Manager : Bonnie Pu					

Sample Detail						Metals M8	Metals M8 filtered
						X	X
Sydney Laboratory - NATA # 1261 Site # 18217							
External Laboratory							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	SWDUP2	Feb 14, 2024		Water	S24-Fe0044850	X	
2	GWDUP2	Feb 13, 2024		Water	S24-Fe0044851		X
Test Counts						1	1

Internal Quality Control Review and Glossary

General

- Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follow guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013. They are included in this QC report where applicable. Additional QC data may be available on request.
- All soil/sediment/solid results are reported on a dry weight basis unless otherwise stated.
- All biota/food results are reported on a wet weight basis on the edible portion unless otherwise stated.
- For CEC results where the sample's origin is unknown or environmentally contaminated, the results should be used advisedly.
- Actual LORs are matrix dependent. Quoted LORs may be raised where sample extracts are diluted due to interferences.
- Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
- SVOC analysis on waters is performed on homogenised, unfiltered samples unless noted otherwise.
- Samples were analysed on an 'as received' basis.
- Information identified in this report with blue colour indicates data provided by customers that may have an impact on the results.
- This report replaces any interim results previously issued.

Holding Times

Please refer to the 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours before sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and despite any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling; therefore, compliance with these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether, the holding time is 7 days; however, for all other VOCs, such as BTEX or C6-10 TRH, the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ppm: parts per million
µg/L: micrograms per litre	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit	Colour: Pt-Co Units	

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples, these are performed on laboratory-certified clean sands and in the case of water samples, these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
TBTO	Tributyltin oxide (<i>bis</i> -tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however, free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should only be used as a guide and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is ≤30%; however, the following acceptance guidelines are equally applicable:

Results <10 times the LOR:	No Limit
Results between 10-20 times the LOR:	RPD must lie between 0-50%
Results >20 times the LOR:	RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%, VOC recoveries 70 – 130%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 5.4, where no positive PFAS results have been reported or reviewed, and no data was affected.

QC Data General Comments

- Where a result is reported as less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
- Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown are not data from your samples.
- pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
- Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
- For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
- Duplicate RPDs are calculated from raw analytical data; thus, it is possible to have two sets of data.

Quality Control Results

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank									
Heavy Metals									
Arsenic			mg/L	< 0.001			0.001	Pass	
Arsenic (filtered)			mg/L	< 0.001			0.001	Pass	
Cadmium			mg/L	< 0.0002			0.0002	Pass	
Cadmium (filtered)			mg/L	< 0.0002			0.0002	Pass	
Chromium			mg/L	< 0.001			0.001	Pass	
Chromium (filtered)			mg/L	< 0.001			0.001	Pass	
Copper			mg/L	< 0.001			0.001	Pass	
Copper (filtered)			mg/L	< 0.001			0.001	Pass	
Lead			mg/L	< 0.001			0.001	Pass	
Lead (filtered)			mg/L	< 0.001			0.001	Pass	
Mercury			mg/L	< 0.0001			0.0001	Pass	
Mercury (filtered)			mg/L	< 0.0001			0.0001	Pass	
Nickel			mg/L	< 0.001			0.001	Pass	
Nickel (filtered)			mg/L	< 0.001			0.001	Pass	
Zinc			mg/L	< 0.005			0.005	Pass	
Zinc (filtered)			mg/L	< 0.005			0.005	Pass	
LCS - % Recovery									
Heavy Metals									
Arsenic			%	93			80-120	Pass	
Arsenic (filtered)			%	83			80-120	Pass	
Cadmium			%	90			80-120	Pass	
Cadmium (filtered)			%	82			80-120	Pass	
Chromium			%	88			80-120	Pass	
Chromium (filtered)			%	83			80-120	Pass	
Copper			%	87			80-120	Pass	
Copper (filtered)			%	82			80-120	Pass	
Lead			%	90			80-120	Pass	
Lead (filtered)			%	84			80-120	Pass	
Mercury			%	98			80-120	Pass	
Mercury (filtered)			%	86			80-120	Pass	
Nickel			%	88			80-120	Pass	
Nickel (filtered)			%	83			80-120	Pass	
Zinc			%	88			80-120	Pass	
Zinc (filtered)			%	82			80-120	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S24-Fe0044850	CP	%	104			75-125	Pass	
Cadmium	S24-Fe0044850	CP	%	98			75-125	Pass	
Chromium	S24-Fe0044850	CP	%	97			75-125	Pass	
Copper	S24-Fe0044850	CP	%	94			75-125	Pass	
Lead	S24-Fe0044850	CP	%	97			75-125	Pass	
Mercury	S24-Fe0044850	CP	%	94			75-125	Pass	
Nickel	S24-Fe0044850	CP	%	94			75-125	Pass	
Zinc	S24-Fe0044850	CP	%	93			75-125	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic (filtered)	N24-Fe0039874	NCP	%	92			75-125	Pass	
Cadmium (filtered)	N24-Fe0039874	NCP	%	84			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Chromium (filtered)	N24-Fe0039874	NCP	%	81			75-125	Pass	
Lead (filtered)	N24-Fe0039874	NCP	%	80			75-125	Pass	
Mercury (filtered)	N24-Fe0039874	NCP	%	83			75-125	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S24-Fe0044548	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium	S24-Fe0044548	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium	S24-Fe0044548	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper	S24-Fe0044548	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Lead	S24-Fe0044548	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Mercury	S24-Fe0044548	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel	S24-Fe0044548	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Zinc	S24-Fe0044548	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic (filtered)	N24-Fe0039857	NCP	mg/L	0.001	0.001	<1	30%	Pass	
Cadmium (filtered)	N24-Fe0039857	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium (filtered)	N24-Fe0039857	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper (filtered)	N24-Fe0039857	NCP	mg/L	0.003	0.003	1.7	30%	Pass	
Lead (filtered)	N24-Fe0039857	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Mercury (filtered)	N24-Fe0039857	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel (filtered)	N24-Fe0039857	NCP	mg/L	0.002	0.002	2.0	30%	Pass	
Zinc (filtered)	N24-Fe0039857	NCP	mg/L	0.023	0.022	<1	30%	Pass	

Comments
Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Bonnie Pu	Analytical Services Manager
Fang Yee Tan	Senior Analyst-Metal
Mickael Ros	Senior Analyst-Metal



Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 T: +61 7 3902 4600 +61 2 4968 8448 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

Eurofins ARL Pty Ltd

ABN: 91 05 0159 898

Perth
46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370

Eurofins Environment Testing NZ Ltd

NZBN: 9429046024954

Auckland	Auckland (Asb)	Christchurch	Tauranga
35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	1277 Cameron Road, Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402

Sample Receipt Advice

Company name:	GHD Pty Ltd NSW
Contact name:	Henry Luo
Project name:	M12 WATER SAMPLING
Project ID:	12554717
Turnaround time:	5 Day
Date/Time received	Mar 18, 2024 1:40 PM
Eurofins reference	1079293

Sample Information

- ✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ Sample Temperature of chilled sample on the batch as recorded by Eurofins Sample Receipt : 3.3 degrees Celsius.
- ✓ All samples have been received as described on the above COC.
- ✓ COC has been completed correctly.
- ✓ Attempt to chill was evident.
- ✓ Appropriately preserved sample containers have been used.
- ✓ All samples were received in good condition.
- ✓ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ✓ Appropriate sample containers have been used.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Bonnie Pu on phone : or by email: BonniePu@eurofins.com

Results will be delivered electronically via email to Henry Luo - henry.luo@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd NSW email address.



web: www.eurofins.com.au
email: EnviroSales@eurofins.com

ABN: 50 005 085 521

Melbourne 6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	Geelong 19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	Sydney 179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Canberra Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	Brisbane 1/21 Smallwood Place Murarie QLD 4172 T: +61 7 3902 4600 NATA# 1261 Site# 20794	Newcastle 1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

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Company Name: GHD Pty Ltd NSW
Address: Level 15, 133 Castlereagh Street
Sydney
NSW 2000

Project Name: M12 WATER SAMPLING
Project ID: 12554717

Order No.:
Report #: 1079293
Phone: 02 9239 7100
Fax: 02 9239 7199

Received: Mar 18, 2024 1:40 PM
Due: Mar 25, 2024
Priority: 5 Day
Contact Name: Henry Luo

Eurofins Analytical Services Manager : Bonnie Pu

Sample Detail						Metals M8	Metals M8 filtered
						X	X
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	SWDUP2	Mar 14, 2024		Water	S24-Ma0043136	X	
2	GWDUP2	Mar 15, 2024		Water	S24-Ma0043137		X
Test Counts						1	1

GHD Pty Ltd NSW
Level 15, 133 Castlereagh Street
Sydney
NSW 2000



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition
Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection, proficiency testing scheme providers and
reference materials producers reports and certificates.

Attention: Henry Luo

Report 1079293-W
Project name M12 WATER SAMPLING
Project ID 12554717
Received Date Mar 18, 2024

Client Sample ID			SWDUP2	GWDUP2
Sample Matrix			Water	Water
Eurofins Sample No.			S24- Ma0043136	S24- Ma0043137
Date Sampled			Mar 14, 2024	Mar 15, 2024
Test/Reference	LOR	Unit		
Heavy Metals				
Arsenic	0.001	mg/L	0.002	-
Arsenic (filtered)	0.001	mg/L	-	0.004
Cadmium	0.0002	mg/L	< 0.0002	-
Cadmium (filtered)	0.0002	mg/L	-	< 0.0002
Chromium	0.001	mg/L	< 0.001	-
Chromium (filtered)	0.001	mg/L	-	< 0.001
Copper	0.001	mg/L	0.004	-
Copper (filtered)	0.001	mg/L	-	< 0.001
Lead	0.001	mg/L	0.001	-
Lead (filtered)	0.001	mg/L	-	< 0.001
Mercury	0.0001	mg/L	< 0.0001	-
Mercury (filtered)	0.0001	mg/L	-	< 0.0001
Nickel	0.001	mg/L	0.002	-
Nickel (filtered)	0.001	mg/L	-	< 0.001
Zinc	0.005	mg/L	0.021	-
Zinc (filtered)	0.005	mg/L	-	< 0.005

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Metals M8	Sydney	Mar 20, 2024	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Metals M8 filtered	Sydney	Mar 20, 2024	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			



web: www.eurofins.com.au
email: EnviroSales@eurofins.com

ABN: 50 005 085 521

Melbourne 6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	Geelong 19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	Sydney 179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Canberra Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	Brisbane 1/21 Smallwood Place Murarie QLD 4172 T: +61 7 3902 4600 NATA# 1261 Site# 20794	Newcastle 1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

ABN: 91 05 0159 898

Perth 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370

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Auckland 35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Auckland (Asb) Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	Tauranga 1277 Cameron Road, Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402

Company Name:	GHD Pty Ltd NSW	Order No.:		Received:	Mar 18, 2024 1:40 PM
Address:	Level 15, 133 Castlereagh Street Sydney NSW 2000	Report #:	1079293	Due:	Mar 25, 2024
		Phone:	02 9239 7100	Priority:	5 Day
		Fax:	02 9239 7199	Contact Name:	Henry Luo
Project Name:	M12 WATER SAMPLING				
Project ID:	12554717				

Eurofins Analytical Services Manager : Bonnie Pu

Sample Detail						Metals M8	Metals M8 filtered
						X	X
Sydney Laboratory - NATA # 1261 Site # 18217							
External Laboratory							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	SWDUP2	Mar 14, 2024		Water	S24-Ma0043136	X	
2	GWDUP2	Mar 15, 2024		Water	S24-Ma0043137		X
Test Counts						1	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follow guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013. They are included in this QC report where applicable. Additional QC data may be available on request.
2. Unless otherwise stated, all soil/sediment/solid results are reported on a dry weight basis.
3. Unless otherwise stated, all biota/food results are reported on a wet weight basis on the edible portion.
4. For CEC results where the sample's origin is unknown or environmentally contaminated, the results should be used advisedly.
5. Actual LORs are matrix dependent. Quoted LORs may be raised where sample extracts are diluted due to interferences.
6. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
7. SVOC analysis on waters is performed on homogenised, unfiltered samples unless noted otherwise.
8. Samples were analysed on an 'as received' basis.
9. Information identified in this report with **blue** colour indicates data provided by customers that may have an impact on the results.
10. This report replaces any interim results previously issued.

Holding Times

Please refer to the 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours before sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and despite any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling; therefore, compliance with these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether, the holding time is seven days; however, for all other VOCs, such as BTEX or C6-10 TRH, the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ppm: parts per million
µg/L: micrograms per litre	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit	Colour: Pt-Co Units	

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples, these are performed on laboratory-certified clean sands and in the case of water samples, these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
TBTO	Tributyltin oxide (<i>bis</i> -tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however, free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 6.0
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should only be used as a guide and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is ≤30%; however, the following acceptance guidelines are equally applicable:

Results <10 times the LOR:	No Limit
Results between 10-20 times the LOR:	RPD must lie between 0-50%
Results >20 times the LOR:	RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%, VOC recoveries 70 – 130%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 6.0, where no positive PFAS results have been reported or reviewed, and no data was affected.

QC Data General Comments

1. Where a result is reported as less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown are not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data; thus, it is possible to have two sets of data.

Quality Control Results

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank									
Heavy Metals									
Arsenic			mg/L	< 0.001			0.001	Pass	
Arsenic (filtered)			mg/L	< 0.001			0.001	Pass	
Cadmium			mg/L	< 0.0002			0.0002	Pass	
Cadmium (filtered)			mg/L	< 0.0002			0.0002	Pass	
Chromium			mg/L	< 0.001			0.001	Pass	
Chromium (filtered)			mg/L	< 0.001			0.001	Pass	
Copper			mg/L	< 0.001			0.001	Pass	
Copper (filtered)			mg/L	< 0.001			0.001	Pass	
Lead			mg/L	< 0.001			0.001	Pass	
Lead (filtered)			mg/L	< 0.001			0.001	Pass	
Mercury			mg/L	< 0.0001			0.0001	Pass	
Mercury (filtered)			mg/L	< 0.0001			0.0001	Pass	
Nickel			mg/L	< 0.001			0.001	Pass	
Nickel (filtered)			mg/L	< 0.001			0.001	Pass	
Zinc			mg/L	< 0.005			0.005	Pass	
Zinc (filtered)			mg/L	< 0.005			0.005	Pass	
LCS - % Recovery									
Heavy Metals									
Arsenic			%	98			80-120	Pass	
Arsenic (filtered)			%	99			80-120	Pass	
Cadmium			%	96			80-120	Pass	
Cadmium (filtered)			%	97			80-120	Pass	
Chromium			%	97			80-120	Pass	
Chromium (filtered)			%	97			80-120	Pass	
Copper			%	96			80-120	Pass	
Copper (filtered)			%	96			80-120	Pass	
Lead			%	98			80-120	Pass	
Lead (filtered)			%	97			80-120	Pass	
Mercury			%	102			80-120	Pass	
Mercury (filtered)			%	103			80-120	Pass	
Nickel			%	96			80-120	Pass	
Nickel (filtered)			%	96			80-120	Pass	
Zinc			%	103			80-120	Pass	
Zinc (filtered)			%	95			80-120	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	N24-Ma0040450	NCP	%	100			75-125	Pass	
Cadmium	N24-Ma0040450	NCP	%	97			75-125	Pass	
Chromium	N24-Ma0040450	NCP	%	98			75-125	Pass	
Copper	N24-Ma0040450	NCP	%	96			75-125	Pass	
Lead	N24-Ma0040450	NCP	%	99			75-125	Pass	
Mercury	N24-Ma0040450	NCP	%	100			75-125	Pass	
Nickel	N24-Ma0040450	NCP	%	96			75-125	Pass	
Zinc	N24-Ma0040450	NCP	%	96			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S24-Ma0035096	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium	S24-Ma0035096	NCP	mg/L	0.0003	0.0003	3.4	30%	Pass	
Chromium	S24-Ma0035096	NCP	mg/L	0.002	0.002	14	30%	Pass	
Copper	S24-Ma0035096	NCP	mg/L	0.005	0.005	3.0	30%	Pass	
Lead	S24-Ma0035096	NCP	mg/L	0.004	0.004	6.1	30%	Pass	
Mercury	S24-Ma0035096	NCP	mg/L	0.0002	0.0002	5.4	30%	Pass	
Nickel	S24-Ma0035096	NCP	mg/L	0.008	0.008	1.4	30%	Pass	
Zinc	S24-Ma0035096	NCP	mg/L	0.78	0.78	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic (filtered)	S24-Ma0043137	CP	mg/L	0.004	0.004	2.4	30%	Pass	
Cadmium (filtered)	S24-Ma0043137	CP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium (filtered)	S24-Ma0043137	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper (filtered)	S24-Ma0043137	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Lead (filtered)	S24-Ma0043137	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Mercury (filtered)	S24-Ma0043137	CP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel (filtered)	S24-Ma0043137	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Zinc (filtered)	S24-Ma0043137	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	

Comments
Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Nileshni Goundar
Fang Yee Tan

Analytical Services Manager
Senior Analyst-Metal



Glenn Jackson
Managing Director

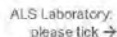
Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

Eurofins shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.

[illegible][illegible]

CLIENT: GHD Pty Ltd		TURNAROUND REQUIREMENT ☐ Standard TAT (List due date):		STANDARD TAT		FOR LABORATORY USE ONLY (Circle)			
OFFICE: Sydney		(Standard TAT may be longer for some tests e.g., Ultra Trace) ☐ Non Standard or urgent TAT (List due date):				Custody Seal Intact? Yes No N/A			
PROJECT: M12 Groundwater		ALS QUOTE NO.: SY322F21		COC SEQUENCE NUMBER (Circle)		Free ice / frozen ice bricks present upon receipt? Yes No N/A			
ORDER NUMBER: 12554717				COC: 1 2 3 4 5 6 7		Random Sample Temperature on Receipt: °C			
PROJECT MANAGER: Henry Luo		CONTACT PH: Henry Luo 0414 090 002		OP: 1 2 3 4 5 6 7		Other comment:			
SAMPLER: Emily Smith, Terry Nham		SAMPLER MOBILE: 0431 522 928		RELINQUISHED BY:		RECEIVED BY:		RECEIVED BY:	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default): ESDAT		Emily Smith		DATE/TIME: 08-10-2023 16:15		DATE/TIME	
Email Reports to: henry.luo@ghd.com; emily.smith@ghd.com; terry.nham@ghd.com;		esdat+ghd_au@esdatlabsync.net		DATE/TIME: 08/10/23 16:15		DATE/TIME		DATE/TIME	

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Please use separate workorders for the M12 Groundwater and M12 Surface Water COCs provided

ALS USE	SAMPLE DETAILS			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required):										
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	Comments	TOTAL CONTAINERS	W-02 (8 dissolved metals)	EO020F (dissolved Fe, filter)	W-04 (TRH/BTEXN)	NT-08A (TN, NO2, NO3, NH3, TP, soluble Reactive P)	NT-01D & 02 (major cations & anions, Hardness)	EA015H (TDS)	EA025H (SS)	W-02T (8 total metals)	BTEXN		
1	BH104R	6/10/2023	Water		6	X	X	X	X	X	X	X				
2	BH107R	6/10/2023	Water		6	X	X	X	X	X	X	X				
3	BH112R	6/10/2023	Water		6	X	X	X	X	X	X	X				
4	BH145R	6/10/2023	Water		6	X	X	X	X	X	X	X				
5	GWDUP1	6/10/2023	Water		1	X										
6	GWRB1	6/10/2023	Water		1									X		
7	Trip spike	6/10/2023	Water		1										X	
8	Trip blank	6/10/2023	Water		1										X	

Environmental Division
Sydney
Work Order Reference
ES2334429



Environmental Division
Sydney
Work Order Reference
ES2334429



Telephone : + 61-2-8784 8555

НТ



SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2334429**

Client : **GHD PTY LTD**
Contact : **MR HENRY LUO**
Address : **LEVEL 15, 133 CASTLEREAGH STREET
SYDNEY NSW, AUSTRALIA 2000**

Laboratory : **Environmental Division Sydney**
Contact : **Sarah Mathew**
Address : **277-289 Woodpark Road Smithfield
NSW Australia 2164**

E-mail : **henry.luo@ghd.com**
Telephone : **+61 02 9239 7100**
Facsimile : **+61 02 9239 7199**

E-mail : **sarah.mathew@alsglobal.com**
Telephone : **+61-2-8784 8555**
Facsimile : **+61-2-8784 8500**

Project : **12554717**
Order number : **12554717**
C-O-C number : **----**
Site : **----**
Sampler : **EMILY SMITH, TERRY NHAM**

Page : **1 of 3**
Quote number : **ES2021GHDSE0026 (SY/322/21)**
QC Level : **NEPM 2013 B3 & ALS QC Standard**

Dates

Date Samples Received : **06-Oct-2023 16:15**
Client Requested Due : **12-Oct-2023**
Date

Issue Date : **06-Oct-2023**
Scheduled Reporting Date : **12-Oct-2023**

Delivery Details

Mode of Delivery : **Undefined**
No. of coolers/boxes : **8**
Receipt Detail :

Security Seal : **Not Available**
Temperature : **2.3, 2.1, 1.7°C**
No. of samples received / analysed : **8 / 8**

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months $\pm$ 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EG020F Dissolved Metals by ICP/MS	WATER - NT-01D & 02 Major Cations & Anions (Ca, Mg, Na, K, Cl, SO ₄ ,)	WATER - NT-08A Total Nitrogen + NO ₂ + NO ₃ + NH ₃ + Total P +	WATER - W-02 8 Metals	WATER - W-04 TRH/BTEXN
ES2334429-001	06-Oct-2023 00:00	BH104R	✓	✓	✓	✓	✓	✓	✓
ES2334429-002	06-Oct-2023 00:00	BH107R	✓	✓	✓	✓	✓	✓	✓
ES2334429-003	06-Oct-2023 00:00	BH112R	✓	✓	✓	✓	✓	✓	✓
ES2334429-004	06-Oct-2023 00:00	BH145R	✓	✓	✓	✓	✓	✓	✓
ES2334429-005	06-Oct-2023 00:00	GWDUP1						✓	

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP080 BTEXN	WATER - W-02T 8 metals (Total)	WATER - W-18 TRH(C6 - C9)/BTEXN
ES2334429-006	06-Oct-2023 00:00	GWRB1		✓	
ES2334429-007	03-Oct-2023 00:00	Trip Spike	✓		
ES2334429-008	03-Oct-2023 00:00	Trip Blank			✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Accounts Payable Australia

Email accountspayableAU@ghd.com

Email emily.smith@ghd.com

- [illegible]

Email esdat+ghd_au@esdatlabsync.net

Email henry_luo@ghd.com

Email henry.luo@ghd.com

- [illegible]

Email terry.nham@ghd.com

- [illegible]



CERTIFICATE OF ANALYSIS

Work Order : **ES2334429**
Client : **GHD PTY LTD**
Contact : **MR HENRY LUO**
Address : **LEVEL 15, 133 CASTLEREAGH STREET**
SYDNEY NSW, AUSTRALIA 2000
Telephone : **+61 02 9239 7100**
Project : **12554717**
Order number : **12554717**
C-O-C number : **----**
Sampler : **EMILY SMITH, TERRY NHAM**
Site : **----**
Quote number : **SY/322/21**
No. of samples received : **8**
No. of samples analysed : **8**

Page : 1 of 7
Laboratory : Environmental Division Sydney
Contact : Sarah Mathew
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 06-Oct-2023 16:15
Date Analysis Commenced : 07-Oct-2023
Issue Date : 12-Oct-2023 20:18



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
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW



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.

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene 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.
- EP080: Sample TRIP SPIKE contains volatile compounds spiked into the sample containers prior to dispatch from the laboratory. BTEXN compounds spiked at 20 ug/L.
- 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.
- 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.



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time				06-Oct-2023 00:00	06-Oct-2023 00:00	06-Oct-2023 00:00	06-Oct-2023 00:00	06-Oct-2023 00:00
Compound	CAS Number	LOR	Unit	ES2334429-001	ES2334429-002	ES2334429-003	ES2334429-004	ES2334429-005
				Result	Result	Result	Result	Result
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	4970	2250	9750	10200	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	102	208	72	47	----
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	1370	508	2290	2510	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	11	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	914	1550	1370	969	----
Total Alkalinity as CaCO3	----	1	mg/L	914	1560	1370	969	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	152	223	2060	350	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	2500	356	3960	5150	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	172	42	229	202	----
Magnesium	7439-95-4	1	mg/L	229	98	417	487	----
Sodium	7440-23-5	1	mg/L	1530	765	2890	2980	----
Potassium	7440-09-7	1	mg/L	19	15	41	18	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	0.002	<0.001	0.011	0.003	0.010
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	0.004	0.016	<0.001	0.014
Nickel	7440-02-0	0.001	mg/L	0.023	0.006	0.016	0.022	0.016
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	0.023	0.018	0.048	0.023	0.046
Manganese	7439-96-5	0.001	mg/L	0.158	0.030	0.133	0.249	----
Iron	7439-89-6	0.05	mg/L	0.70	<0.05	<0.05	4.03	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	1.04	0.09	2.66	1.97	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time					06-Oct-2023 00:00	06-Oct-2023 00:00	06-Oct-2023 00:00	06-Oct-2023 00:00	06-Oct-2023 00:00
Compound	CAS Number	LOR	Unit		ES2334429-001	ES2334429-002	ES2334429-003	ES2334429-004	ES2334429-005
					Result	Result	Result	Result	Result
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.08	0.06	0.32	<0.01	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.01	2.52	1.72	<0.01	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.09	2.58	2.04	<0.01	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		1.3	0.5	2.8	2.2	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		1.4	3.1	4.8	2.2	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.13	0.10	0.29	0.04	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	0.01	0.22	<0.01	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		91.9	45.8	182	172	----
ø Total Cations	----	0.01	meq/L		94.5	43.8	172	180	----
ø Ionic Balance	----	0.01	%		1.35	2.27	2.67	2.36	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	----
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	----
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	----
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	----
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	----
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time					06-Oct-2023 00:00	06-Oct-2023 00:00	06-Oct-2023 00:00	06-Oct-2023 00:00	06-Oct-2023 00:00
Compound	CAS Number	LOR	Unit		ES2334429-001	ES2334429-002	ES2334429-003	ES2334429-004	ES2334429-005
					Result	Result	Result	Result	Result
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	----
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	----
meta- & para-Xylene	108-38-3	106-42-3	2	µg/L	<2	<2	<2	<2	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	----
^ Total Xylenes	----	2	µg/L		<2	<2	<2	<2	----
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	----
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	----
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%		93.0	130	138	129	----
Toluene-D8	2037-26-5	2	%		95.5	111	110	113	----
4-Bromofluorobenzene	460-00-4	2	%		107	96.1	94.7	93.8	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				GWRB1	Trip Spike	Trip Blank	----	----
Sampling date / time				06-Oct-2023 00:00	03-Oct-2023 00:00	03-Oct-2023 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2334429-006	ES2334429-007	ES2334429-008	-----	-----
				Result	Result	Result	----	----
EG020T: Total 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	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	----	----	<20	----	----
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	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	----	21	<1	----	----
Toluene	108-88-3	2	µg/L	----	18	<2	----	----
Ethylbenzene	100-41-4	2	µg/L	----	17	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	----	17	<2	----	----
ortho-Xylene	95-47-6	2	µg/L	----	18	<2	----	----
^ Total Xylenes	----	2	µg/L	----	35	<2	----	----
^ Sum of BTEX	----	1	µg/L	----	91	<1	----	----
Naphthalene	91-20-3	5	µg/L	----	20	<5	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	----	128	141	----	----
Toluene-D8	2037-26-5	2	%	----	104	113	----	----
4-Bromofluorobenzene	460-00-4	2	%	----	89.6	96.2	----	----



Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	72	143
Toluene-D8	2037-26-5	75	131
4-Bromofluorobenzene	460-00-4	73	137



QUALITY CONTROL REPORT

Work Order	: ES2334429	Page	: 1 of 10
Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HENRY LUO	Contact	: Sarah Mathew
Address	: LEVEL 15, 133 CASTLEREAGH STREET SYDNEY NSW, AUSTRALIA 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 9239 7100	Telephone	: +61-2-8784 8555
Project	: 12554717	Date Samples Received	: 06-Oct-2023
Order number	: 12554717	Date Analysis Commenced	: 07-Oct-2023
C-O-C number	: ----	Issue Date	: 12-Oct-2023
Sampler	: EMILY SMITH, TERRY NHAM		
Site	: ----		
Quote number	: SY/322/21		
No. of samples received	: 8		
No. of samples analysed	: 8		



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
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW



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**

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: 5351638)									
ES2334085-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	1360	1350	0.7	0% - 20%
ES2334325-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	546	520	5.1	0% - 20%
ES2334359-010	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	2270	2290	0.9	0% - 20%
ES2334428-009	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	884	956	7.8	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 5351639)									
ES2334085-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	54	44	18.8	0% - 50%
ES2334325-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
ES2334359-010	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	6	6	0.0	No Limit
ES2334428-009	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	10	12	22.7	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 5347620)									
ES2334065-011	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	238	235	1.1	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	238	235	1.1	0% - 20%
ES2334193-004	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	700	711	1.5	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	700	711	1.5	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 5345466)									
ES2334410-005	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2910	2950	1.2	0% - 20%
ES2334410-019	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2810	2690	4.5	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 5345465)									
ES2334410-005	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	3040	3090	1.4	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 (%)
ED045G: Chloride by Discrete Analyser (QC Lot: 5345465) - continued									
ES2334410-019	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	1540	1500	2.6	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 5348544)									
EW2304409-004	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	2	2	0.0	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	2	2	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	11	10	0.0	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.0	No Limit
ES2334048-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	187	188	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	2	2	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	262	264	0.8	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	81	82	1.6	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5348545)									
EW2304409-004	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: Manganese	7439-96-5	0.001	mg/L	0.044	0.042	4.6	0% - 20%
		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
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
ES2334048-001	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	0.002	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.007	0.007	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.002	0.002	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
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5350304)									
ES2334359-006	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: Manganese	7439-96-5	0.001	mg/L	1.12	1.13	1.1	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.072	0.073	1.4	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.034	0.033	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
ES2334223-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	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 (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5350304) - continued									
ES2334223-001	Anonymous	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: Manganese	7439-96-5	0.001	mg/L	0.248	0.249	0.0	0% - 20%
		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	0.022	0.022	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.18	0.18	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 5348560)									
ES2334314-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0050	<0.0050	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.050	<0.050	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.010	<0.010	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.050	<0.050	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.010	<0.010	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.050	<0.050	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	3.23	3.29	1.6	0% - 20%
ES2334428-008	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.006	0.006	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.018	0.017	7.2	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 5348547)									
ES2334429-002	BH107R	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ME2301814-006	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 5350307)									
ES2334426-011	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
WN2312032-008	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5350324)									
ES2333696-001	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2334428-009	Anonymous	EG035T: 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: 5346282)									
ES2334429-004	BH145R	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	1.97	1.98	0.6	0% - 20%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 5345467)									
ES2334410-019	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2334436-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.06	0.06	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 5346281)									
ES2334359-008	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.07	0.07	0.0	No Limit

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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 (%)
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 5346281) - continued									
ES2334428-006	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.01	0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 5346283)									
ES2334429-004	BH145R	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 5346277)									
ES2334359-009	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.4	0.4	0.0	No Limit
ES2334429-001	BH104R	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.3	1.2	0.0	0% - 50%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 5346278)									
ES2334428-004	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.06	0.07	0.0	No Limit
ES2334429-001	BH104R	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.13	0.12	0.0	0% - 50%
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 5345468)									
ES2334428-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.01	<0.01	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5346627)									
ES2334051-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES2334065-010	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5346627)									
ES2334051-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
ES2334065-010	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 5346627)									
ES2334051-001	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	2	µg/L	<2	<2	0.0	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
ES2334065-010	Anonymous	EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
		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	2	µg/L	<2	<2	0.0	No Limit
			106-42-3						
		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**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 5351638)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	99.2	87.0	109
				<10	293 mg/L	102	75.2	126
				<10	2470 mg/L	99.4	83.0	124
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 5351639)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	96.0	83.0	129
				<5	1000 mg/L	98.6	82.0	110
				<5	841 mg/L	94.5	83.0	118
ED037P: Alkalinity by PC Titrator (QCLot: 5347620)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	99.6	81.0	115
				----	50 mg/L	105	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 5345466)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	106	82.0	122
				<1	500 mg/L	104	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 5345465)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	94.4	80.9	127
				<1	1000 mg/L	92.2	80.9	127
ED093F: Dissolved Major Cations (QCLot: 5348544)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	111	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	108	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	108	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	109	85.0	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 5348545)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	110	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	106	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	103	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	109	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	104	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	108	82.0	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	105	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	116	81.0	117
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	105	82.0	112

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 5350304)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	108	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	109	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	108	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	106	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	106	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	109	82.0	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	104	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	103	81.0	117
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	107	82.0	112
EG020T: Total Metals by ICP-MS (QCLot: 5348560)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	111	82.0	114
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	104	84.0	112
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	113	86.0	116
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	114	83.0	118
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	112	85.0	115
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	110	84.0	116
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	111	79.0	117
EG035F: Dissolved Mercury by FIMS (QCLot: 5348547)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	90.6	83.0	105
EG035F: Dissolved Mercury by FIMS (QCLot: 5350307)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	97.5	83.0	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5350324)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	99.3	77.0	111
EK055G: Ammonia as N by Discrete Analyser (QCLot: 5346282)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	102	90.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5345467)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	100	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5346281)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	103	91.0	113
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5346283)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	104	91.0	113
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5346277)								



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5346277) - continued								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	96.9	69.0	101
				<0.1	1 mg/L	94.1	70.0	118
				<0.1	5 mg/L	81.8	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5346278)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	99.1	71.3	126
				<0.01	0.442 mg/L	101	71.3	126
				<0.01	1 mg/L	85.5	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 5345468)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	103	85.0	117
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5346557)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	68.4	53.7	97.0
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	83.4	63.3	107
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	80.1	58.3	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5346627)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	117	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5346557)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	72.2	53.9	95.5
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	92.2	57.8	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	78.2	50.5	115
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5346627)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	117	75.0	127
EP080: BTEXN (QCLot: 5346627)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	115	68.3	119
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	104	73.5	120
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	98.0	73.8	122
EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	10 µg/L	99.9	73.0	122
	106-42-3							
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	98.0	76.4	123
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	100	75.5	124

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**

Matrix Spike (MS) Report

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 Project : 12554717



Sub-Matrix: **WATER**

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: 5345466)							
ES2334410-005	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 5345465)							
ES2334410-005	Anonymous	ED045G: Chloride	16887-00-6	50 mg/L	# Not Determined	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 5348545)							
ES2334281-001	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	108	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	107	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	104	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	113	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	112	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	108	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	105	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	110	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 5350304)							
ES2334223-002	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	105	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	110	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	109	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	107	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	107	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	110	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	106	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	108	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 5348560)							
ES2334416-001	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	114	70.0	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	113	70.0	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	112	70.0	130
		EG020A-T: Copper	7440-50-8	1 mg/L	114	70.0	130
		EG020A-T: Lead	7439-92-1	1 mg/L	112	70.0	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	111	70.0	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	114	70.0	130
		EG035F: Dissolved Mercury by FIMS (QCLot: 5348547)					
ES2334429-001	BH104R	EG035F: Mercury	7439-97-6	0.01 mg/L	75.2	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 5350307)							
ES2334426-010	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	90.4	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5350324)							
ES2333696-002	Anonymous	EG035T: Mercury	7439-97-6	0.02 mg/L	74.0	70.0	130



Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK055G: Ammonia as N by Discrete Analyser (QCLot: 5346282)							
ES2334429-004	BH145R	EK055G: Ammonia as N	7664-41-7	1 mg/L	126	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5345467)							
ES2334428-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	101	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5346281)							
ES2334359-008	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	110	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5346283)							
ES2334429-004	BH145R	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	111	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5346277)							
ES2334359-010	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	99.2	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5346278)							
ES2334428-005	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	94.7	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 5345468)							
ES2334428-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	102	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5346627)							
ES2334051-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	112	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5346627)							
ES2334051-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	111	70.0	130
EP080: BTEXN (QCLot: 5346627)							
ES2334051-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	111	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	101	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	98.6	70.0	130
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	97.4	70.0	130
		106-42-3					
		EP080: ortho-Xylene	95-47-6	25 µg/L	97.5	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	112	70.0	130



QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES2334429	Page	: 1 of 9
Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HENRY LUO	Telephone	: +61-2-8784 8555
Project	: 12554717	Date Samples Received	: 06-Oct-2023
Site	: ----	Issue Date	: 12-Oct-2023
Sampler	: EMILY SMITH, TERRY NHAM	No. of samples received	: 8
Order number	: 12554717	No. of samples analysed	: 8

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.

Page : 2 of 9
 Work Order : ES2334429
 Client : GHD PTY LTD
 Project : 12554717



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							
ED041G: Sulfate (Turbidimetric) as SO ₄ 2- by DA	ES2334410--005	Anonymous	Sulfate as SO ₄ - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	ES2334410--005	Anonymous	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
	0				
Laboratory Duplicates (DUP)					
TRH - Semivolatile Fraction	0	7	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
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		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			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)								
BH104R,	BH107R,	06-Oct-2023	----	----	----	11-Oct-2023	13-Oct-2023	✔
BH112R,	BH145R							
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
BH104R,	BH107R,	06-Oct-2023	----	----	----	11-Oct-2023	13-Oct-2023	✔
BH112R,	BH145R							
EA065: Total Hardness as CaCO₃								
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)								
BH104R,	BH107R,	06-Oct-2023	----	----	----	10-Oct-2023	03-Nov-2023	✔
BH112R,	BH145R							



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P) BH104R, BH112R,	BH107R, BH145R	06-Oct-2023	----	----	----	09-Oct-2023	20-Oct-2023	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G) BH104R, BH112R,	BH107R, BH145R	06-Oct-2023	----	----	----	07-Oct-2023	03-Nov-2023	✓
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G) BH104R, BH112R,	BH107R, BH145R	06-Oct-2023	----	----	----	07-Oct-2023	03-Nov-2023	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BH104R, BH112R,	BH107R, BH145R	06-Oct-2023	----	----	----	10-Oct-2023	03-Nov-2023	✓
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) BH104R, BH112R, GWDUP1	BH107R, BH145R,	06-Oct-2023	----	----	----	10-Oct-2023	03-Apr-2024	✓
EG020T: Total Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T) GWRB1		06-Oct-2023	10-Oct-2023	03-Apr-2024	✓	10-Oct-2023	03-Apr-2024	✓
EG035F: Dissolved Mercury by FIMS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) BH104R, BH112R,	BH107R, BH145R	06-Oct-2023	----	----	----	11-Oct-2023	03-Nov-2023	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) GWDUP1		06-Oct-2023	----	----	----	12-Oct-2023	03-Nov-2023	✓
EG035T: Total Recoverable Mercury by FIMS								
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG035T) GWRB1		06-Oct-2023	----	----	----	12-Oct-2023	03-Nov-2023	✓
EK055G: Ammonia as N by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK055G) BH104R, BH112R,	BH107R, BH145R	06-Oct-2023	----	----	----	11-Oct-2023	03-Nov-2023	✓
EK057G: Nitrite as N by Discrete Analyser								
Clear Plastic Bottle - Natural (EK057G) BH104R, BH112R,	BH107R, BH145R	06-Oct-2023	----	----	----	07-Oct-2023	08-Oct-2023	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G) BH104R, BH112R, BH107R, BH145R	06-Oct-2023	----	----	----	11-Oct-2023	03-Nov-2023	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G) BH104R, BH112R, BH107R, BH145R	06-Oct-2023	09-Oct-2023	03-Nov-2023	✓	11-Oct-2023	03-Nov-2023	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G) BH104R, BH112R, BH107R, BH145R	06-Oct-2023	09-Oct-2023	03-Nov-2023	✓	11-Oct-2023	03-Nov-2023	✓
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural (EK071G) BH104R, BH112R, BH107R, BH145R	06-Oct-2023	----	----	----	07-Oct-2023	08-Oct-2023	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) BH104R, BH112R, BH107R, BH145R	06-Oct-2023	09-Oct-2023	13-Oct-2023	✓	10-Oct-2023	18-Nov-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) Trip Blank	03-Oct-2023	10-Oct-2023	17-Oct-2023	✓	11-Oct-2023	17-Oct-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH104R, BH112R, BH107R, BH145R	06-Oct-2023	10-Oct-2023	20-Oct-2023	✓	11-Oct-2023	20-Oct-2023	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071) BH104R, BH112R, BH107R, BH145R	06-Oct-2023	09-Oct-2023	13-Oct-2023	✓	10-Oct-2023	18-Nov-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) Trip Blank	03-Oct-2023	10-Oct-2023	17-Oct-2023	✓	11-Oct-2023	17-Oct-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH104R, BH112R, BH107R, BH145R	06-Oct-2023	10-Oct-2023	20-Oct-2023	✓	11-Oct-2023	20-Oct-2023	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) Trip Spike, Trip Blank	03-Oct-2023	10-Oct-2023	17-Oct-2023	✓	11-Oct-2023	17-Oct-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH104R, BH112R, BH107R, BH145R	06-Oct-2023	10-Oct-2023	20-Oct-2023	✓	11-Oct-2023	20-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	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	7	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	4	27	14.81	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	3	21	14.29	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
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	40	10.00	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	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	14	14.29	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	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	27	7.41	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	21	9.52	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
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	5	40	12.50	12.50	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	5	40	12.50	12.50	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	20	15.00	15.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	14	21.43	15.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	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	
Laboratory Control Samples (LCS) - Continued							
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	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	27	7.41	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	21	9.52	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
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	40	5.00	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	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	14	7.14	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	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	27	7.41	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	21	9.52	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
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	14	7.14	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)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. 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 thiocyanate forms highly-coloured ferric thiocyanate 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 0.45um 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.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. 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 0.45um 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).



Analytical Methods	Method	Matrix	Method Descriptions
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ 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-NH ₃ 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-NO ₂ - 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-NO ₃ - F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined separately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NO _x) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO ₃ - F. Combined oxidised Nitrogen (NO ₂ +NO ₃) 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-NO ₃ -. 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)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with orthophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO ₄ 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)
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)
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)



Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. 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.

ALS Laboratory:
please tick →

CORPORATE AND GENERAL INFORMATION OF THE ISSUER

CLIENT: GHD Pty Ltd		TURNAROUND REQUIREMENT ☐ Standard TAT (List due date):		STANDARD TAT		FOR LABORATORY USE ONLY (Circle)					
OFFICE: Sydney		(Standard TAT may be longer for some tests e.g., Ultra Trace) ☐ Non Standard or urgent TAT (List due date):				Custody Seal intact? Yes No N/A					
PROJECT: M12 Groundwater		ALS QUOTE NO.: SY/322/21		COC SEQUENCE NUMBER (Circle)		Free ice / frozen ice bricks present upon receipt? Yes No N/A					
ORDER NUMBER: 12554717				COC: 1 2 3 4 5 6 7		Random Sample Temperature on Receipt: °C					
PROJECT MANAGER: Henry Luo		CONTACT PH: Henry Luo 0414 090 002		OF: 1 2 3 4 5 6 7		Other comment:					
SAMPLER: Emily Smith, Andrew Duval		SAMPLER MOBILE: 0431 522 928		RELINQUISHED BY:		RECEIVED BY:		RELINQUISHED BY:		RECEIVED BY:	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default): ESDAT		Andrew Duval (GHD)		Ashid					
Email Reports to: emily.smith@ghd.com; henry.luo@ghd.com; andrew.duval@ghd.com; esdat+ghd_au@esdatlabsync.net				DATE/TIME: 9/11/2023 - 4pm		DATE/TIME: 9/11/2023					

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Please keep M12 Groundwater as a separate workorder to M12 Surface Water as per the COCs provided.

[illegible]



mgt

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CHAIN OF CUSTODY RECORD**CLIENT DETAILS**Page 1 of 1

Company Name : GHD Pty Ltd, Sydney	Contact Name : Emily Smith 0431 522 928	Purchase Order : 12554717	COC Number :
Office Address :	Project Manager: Henry Luo 0414 090 002	PROJECT Number : 12554717	Eurofins mgt quote ID :
Level 15, 133 Castlereagh Street, Sydney NSW 2000	Email for results : emily.smith@ghd.com; henry.luo@ghd.com; andrew.duval@ghd.com; esdat+ghd_au@esdatlabsync.net	PROJECT Name : M12 Water Sampling	Data output format: ESDAT

	Analytes							Some common holding times (with correct preservation). For further information contact the lab			
Special Directions & Comments :	ed metals	ed metals						Waters		Soils	
								BTEX, MAH, VOC	14 days	BTEX, MAH, VOC	14 days
								TRH, PAH, Phenols, Pesticides	7 days	TRH, PAH, Phenols, Pesticides	14 days
								Heavy Metals	6 months	Heavy Metals	6 months
								Mercury, CrVI	28 days	Mercury, CrVI	28 days
								Microbiological testing	24 hours	Microbiological testing	72 hours
								BOD, Nitrate, Nitrite, Total N	2 days	Anions	26 days
								Solids - TSS, TDS etc	7 days	SPOCAS, pH Field and FOX, CrS	24 hours
								Ferrous iron	7 days	ASLP, TCLP	7 days
Eurofins mgt DI water batch number:											

	Sample ID	Date	Matrix	Dissolved metals	Total metals						Containers:								Sample comments:
											500P	250P	60P	1LA	40mL vial	200mL A	Jar	Bag	
1	SWDUP2	9/11/2023	Water		X								1						
2	GWDUP2	8/11/2023	Water	X									1						
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

		Laboratory Staff		Method Of Shipment		Temperature on arrival:
Relinquished By: Andrew Duval	Received By:			☐ Courier		Report number:
Date & Time : 9/11/2023 - 4pm	Date & Time :			☐ Hand Delivered		
Signature:	Signature:			☐ Postal		
				☐ Courier Consignment # :		



SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2338893**

Amendment : **2**

Client : **GHD PTY LTD**
Contact : **MR HENRY LUO**
Address : **LEVEL 15, 133 CASTLEREAGH STREET
SYDNEY NSW, AUSTRALIA 2000**

Laboratory : **Environmental Division Sydney**
Contact : **Sarah Mathew**
Address : **277-289 Woodpark Road Smithfield
NSW Australia 2164**

E-mail : **henry.luo@ghd.com**
Telephone : **+61 02 9239 7100**
Facsimile : **+61 02 9239 7199**

E-mail : **sarah.mathew@alsglobal.com**
Telephone : **+61-2-8784 8555**
Facsimile : **+61-2-8784 8500**

Project : **12554717**
Order number : **12554717**
C-O-C number : **----**
Site : **----**
Sampler : **ANDREW DUVAL, EMILY SMITH**

Page : **1 of 4**
Quote number : **ES2021GHDSE0026 (SY/322/21)**
QC Level : **NEPM 2013 B3 & ALS QC Standard**

Dates

Date Samples Received : **09-Nov-2023 16:15**
Client Requested Due Date : **16-Nov-2023**

Issue Date : **04-Dec-2023**
Scheduled Reporting Date : **16-Nov-2023**

Delivery Details

Mode of Delivery : **Client Drop Off**
No. of coolers/boxes : **7**

Security Seal : **Not Available**
Temperature : **12°C, 16°C, 3.6°C - Ice present**

Receipt Detail :
No. of samples received / analysed : **22 / 22**

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **Sample GWDUP2 and SWDUP2 have been forwarded to EUROFINs**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA025H Suspended Solids - Standard Level	WATER - EG020T Total Metals by ICP/MS (including digestion)	WATER - EP008 Chlorophyll a	WATER - EP020 Oil & Grease (O&G)	WATER - EP074DEFG VOC - Fumigants, Hal Aliphatics, Hal Aromatics,	WATER - NT-08A Total Nitrogen + NO2 + NO3 + NH3 + Total P +	WATER - W-02T 8 metals (Total)
ES2338893-001	08-Nov-2023 00:00	BADDS	✓	✓	✓	✓	✓	✓	✓
ES2338893-002	08-Nov-2023 00:00	BADMS	✓	✓	✓	✓	✓	✓	✓
ES2338893-003	08-Nov-2023 00:00	BADUS	✓	✓	✓	✓	✓	✓	✓
ES2338893-004	08-Nov-2023 00:00	COSDS	✓	✓	✓	✓	✓	✓	✓
ES2338893-005	08-Nov-2023 00:00	COSUS	✓	✓	✓	✓	✓	✓	✓
ES2338893-006	08-Nov-2023 00:00	HINDS	✓	✓	✓	✓	✓	✓	✓
ES2338893-007	08-Nov-2023 00:00	HINUS	✓	✓	✓	✓	✓	✓	✓
ES2338893-008	08-Nov-2023 00:00	KEMDS	✓	✓	✓	✓	✓	✓	✓
ES2338893-009	08-Nov-2023 00:00	KEMUS	✓	✓	✓	✓	✓	✓	✓
ES2338893-010	08-Nov-2023 00:00	ROPDS	✓	✓	✓	✓	✓	✓	✓
ES2338893-011	08-Nov-2023 00:00	ROPUS	✓	✓	✓	✓	✓	✓	✓
ES2338893-012	08-Nov-2023 00:00	SOUUS	✓	✓	✓	✓	✓	✓	✓
ES2338893-013	08-Nov-2023 00:00	SOUUS	✓	✓	✓	✓	✓	✓	✓
ES2338893-014	08-Nov-2023 00:00	SWDUP1							✓
ES2338893-015	08-Nov-2023 00:00	BH104R	✓					✓	
ES2338893-016	08-Nov-2023 00:00	BH107R	✓					✓	
ES2338893-017	08-Nov-2023 00:00	BH112R	✓					✓	
ES2338893-018	09-Nov-2023 00:00	BH145R	✓					✓	
ES2338893-020	08-Nov-2023 00:00	GWRB1							✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EG020F Dissolved Metals by ICP/MS	WATER - EP080 BTEXN	WATER - EP234AX Organophosphorus Pesticides - Extended List (50	WATER - NT-01D & 02 Major Cations & Anions (Ca, Mg, Na, K, Cl, SO4,	WATER - W-02 8 Metals	WATER - W-14A PAH/Phenols (SIM)
ES2338893-001	08-Nov-2023 00:00	BADDS	✓		✓	✓			✓
ES2338893-002	08-Nov-2023 00:00	BADMS	✓		✓	✓			✓
ES2338893-003	08-Nov-2023 00:00	BADUS	✓		✓	✓			✓
ES2338893-004	08-Nov-2023 00:00	COSDS	✓		✓	✓			✓
ES2338893-005	08-Nov-2023 00:00	COSUS	✓		✓	✓			✓



			WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EG020F Dissolved Metals by ICP/MS	WATER - EP080 BTEXN	WATER - EP234AX Organophosphorus Pesticides - Extended List (50	WATER - NT-01D & 02 Major Cations & Anions (Ca, Mg, Na, K, Cl, SO4,	WATER - W-02 8 Metals	WATER - W-14A PAH/Phenols (SIM)
ES2338893-006	08-Nov-2023 00:00	HINDS	✓		✓	✓			✓
ES2338893-007	08-Nov-2023 00:00	HINUS	✓		✓	✓			✓
ES2338893-008	08-Nov-2023 00:00	KEMDS	✓		✓	✓			✓
ES2338893-009	08-Nov-2023 00:00	KEMUS	✓		✓	✓			✓
ES2338893-010	08-Nov-2023 00:00	ROPDS	✓		✓	✓			✓
ES2338893-011	08-Nov-2023 00:00	ROPUS	✓		✓	✓			✓
ES2338893-012	08-Nov-2023 00:00	SOUDS	✓		✓	✓			✓
ES2338893-013	08-Nov-2023 00:00	SOUUS	✓		✓	✓			✓
ES2338893-015	08-Nov-2023 00:00	BH104R	✓	✓			✓	✓	
ES2338893-016	08-Nov-2023 00:00	BH107R	✓	✓			✓	✓	
ES2338893-017	08-Nov-2023 00:00	BH112R	✓	✓			✓	✓	
ES2338893-018	09-Nov-2023 00:00	BH145R	✓	✓			✓	✓	
ES2338893-019	08-Nov-2023 00:00	GWDUP1						✓	
ES2338893-021	08-Nov-2023 00:00	TRIP SPIKE			✓				
ES2338893-022	08-Nov-2023 00:00	TRIP BLANK			✓				
Matrix: WATER									
Laboratory sample ID	Sampling date / time	Sample ID	WATER - W-04 TRH/BTEXN						
ES2338893-015	08-Nov-2023 00:00	BH104R	✓						
ES2338893-016	08-Nov-2023 00:00	BH107R	✓						
ES2338893-017	08-Nov-2023 00:00	BH112R	✓						
ES2338893-018	09-Nov-2023 00:00	BH145R	✓						

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.



CERTIFICATE OF ANALYSIS

Work Order : **ES2338893-AF**

Amendment : **4**

Client : **GHD PTY LTD**

Contact : **MR HENRY LUO**

Address : **LEVEL 15, 133 CASTLEREAGH STREET
SYDNEY NSW, AUSTRALIA 2000**

Telephone : **+61 02 9239 7100**

Project : **12554717**

Order number : **12554717**

C-O-C number : **----**

Sampler : **ANDREW DUVAL, EMILY SMITH**

Site : **----**

Quote number : **SY/322/21**

No. of samples received : **8**

No. of samples analysed : **8**

Page : 1 of 7

Laboratory : Environmental Division Sydney

Contact : Sarah Mathew

Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : +61-2-8784 8555

Date Samples Received : 09-Nov-2023 16:15

Date Analysis Commenced : 10-Nov-2023

Issue Date : 06-Dec-2023 19:57



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
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW



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.

- EP234: Particular samples required dilution due to unsuitable sample matrix. LOR values have been adjusted accordingly.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene 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.
- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- EP080: Sample TRIP SPIKE contains volatile compounds spiked into the sample containers prior to dispatch from the laboratory. BTEXN compounds spiked at 20 ug/L.
- Amendment (30/11/2023): This report has been amended following the request to report all samples on a separate COA. All analysis results are as per the previous report
- Amendment (04/12/2023): This report has been amended following the request to report project ID specific samples on separate COAs. All analysis results are as per the previous report
- 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.
- 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.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time					08-Nov-2023 00:00	08-Nov-2023 00:00	08-Nov-2023 00:00	09-Nov-2023 00:00	08-Nov-2023 00:00
Compound	CAS Number	LOR	Unit		ES2338893-015	ES2338893-016	ES2338893-017	ES2338893-018	ES2338893-019
					Result	Result	Result	Result	Result
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		5170	2220	10600	11900	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		114	496	123	44	----
EA065: Total Hardness as CaCO3									
Total Hardness as CaCO3	----	1	mg/L		1100	512	2100	2500	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		850	1340	1200	890	----
Total Alkalinity as CaCO3	----	1	mg/L		850	1340	1200	890	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		157	194	1780	384	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		2460	272	4270	5310	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		134	37	196	192	----
Magnesium	7439-95-4	1	mg/L		185	102	392	490	----
Sodium	7440-23-5	1	mg/L		1530	689	2770	3020	----
Potassium	7440-09-7	1	mg/L		19	15	40	18	----
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		0.002	<0.001	0.008	<0.001	0.008
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		0.002	0.007	0.006	<0.001	0.008
Nickel	7440-02-0	0.001	mg/L		0.001	0.005	0.009	<0.001	0.009
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		0.006	0.018	0.012	0.005	0.017



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time					08-Nov-2023 00:00	08-Nov-2023 00:00	08-Nov-2023 00:00	09-Nov-2023 00:00	08-Nov-2023 00:00
Compound	CAS Number	LOR	Unit		ES2338893-015	ES2338893-016	ES2338893-017	ES2338893-018	ES2338893-019
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Manganese	7439-96-5	0.001	mg/L		0.120	0.010	0.114	0.185	----
Iron	7439-89-6	0.05	mg/L		0.70	<0.05	<0.05	2.83	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		1.17	0.02	1.93	1.97	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.04	<0.01	0.31	<0.01	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	2.77	1.86	0.01	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.04	2.77	2.17	0.01	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		1.4	1.6	2.6	2.2	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
[^] Total Nitrogen as N	----	0.1	mg/L		1.4	4.4	4.8	2.2	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.12	0.26	0.23	0.03	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	0.16	<0.01	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		89.6	38.5	181	176	----
∅ Total Cations	----	0.01	meq/L		88.9	40.6	164	182	----
∅ Ionic Balance	----	0.01	%		0.39	2.67	5.20	1.72	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	----
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time					08-Nov-2023 00:00	08-Nov-2023 00:00	08-Nov-2023 00:00	09-Nov-2023 00:00	08-Nov-2023 00:00
Compound	CAS Number	LOR	Unit		ES2338893-015	ES2338893-016	ES2338893-017	ES2338893-018	ES2338893-019
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	----
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	----
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	----
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	----
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	----
^ Total Xylenes	----	2	µg/L		<2	<2	<2	<2	----
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	----
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	----
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%		99.4	102	98.4	104	----
Toluene-D8	2037-26-5	2	%		97.4	99.4	96.1	107	----
4-Bromofluorobenzene	460-00-4	2	%		110	112	107	117	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				GWRB1	TRIP SPIKE	TRIP BLANK	----	----
Sampling date / time				08-Nov-2023 00:00	08-Nov-2023 00:00	08-Nov-2023 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2338893-020	ES2338893-021	ES2338893-022	-----	-----
				Result	Result	Result	----	----
EG020T: Total 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	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	----	18	<1	----	----
Toluene	108-88-3	2	µg/L	----	16	<2	----	----
Ethylbenzene	100-41-4	2	µg/L	----	16	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	----	17	<2	----	----
ortho-Xylene	95-47-6	2	µg/L	----	18	<2	----	----
^ Total Xylenes	----	2	µg/L	----	35	<2	----	----
^ Sum of BTEX	----	1	µg/L	----	85	<1	----	----
Naphthalene	91-20-3	5	µg/L	----	21	<5	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	----	97.1	88.3	----	----
Toluene-D8	2037-26-5	2	%	----	96.4	83.5	----	----
4-Bromofluorobenzene	460-00-4	2	%	----	102	95.3	----	----



Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	72	143
Toluene-D8	2037-26-5	75	131
4-Bromofluorobenzene	460-00-4	73	137



QUALITY CONTROL REPORT

Work Order : ES2338893-AE

Page : 1 of 21

Amendment : 5

Client : GHD PTY LTD

Contact : MR HENRY LUO

Address : LEVEL 15, 133 CASTLEREAGH STREET
SYDNEY NSW, AUSTRALIA 2000

Telephone : +61 02 9239 7100

Project : 12554717

Order number : 12554717

C-O-C number : ----

Sampler : ANDREW DUVAL, EMILY SMITH

Site : ----

Quote number : SY/322/21

No. of samples received : 14

No. of samples analysed : 14

Laboratory : Environmental Division Sydney

Contact : Samiksha Sathish

Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : +61-2-8784 8555

Date Samples Received : 09-Nov-2023

Date Analysis Commenced : 10-Nov-2023

Issue Date : 25-Mar-2024



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
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW



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

* = The final LOR has been raised due to dilution or other sample specific cause; adjusted LOR is shown in brackets. The duplicate ranges for Acceptable RPD% are applied to the final LOR where applicable.

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: 5423626)									
ES2338210-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	1680	1620	3.6	0% - 20%
ES2338732-005	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	146	162	10.1	0% - 50%
ES2338808-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	820	826	0.7	0% - 20%
ES2338893-006	HINDS	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	326	328	0.5	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 5423627)									
ES2338210-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
ES2338732-005	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	7	9	25.0	No Limit
ES2338808-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	26	25	0.0	No Limit
ES2338893-006	HINDS	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 5419195)									
ES2338152-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.116	0.111	4.5	0% - 20%
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	0.67	0.62	7.4	0% - 50%
		EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	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 (%)
EG020T: Total Metals by ICP-MS (QC Lot: 5419195) - continued									
ES2338152-011	Anonymous	EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.034	0.036	3.7	0% - 20%
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	0.32	0.32	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 5419196)									
ES2338893-003	BADUS	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.002	0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.004	0.003	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.250	0.252	0.6	0% - 20%
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.006	0.006	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	1.71	1.67	2.4	0% - 20%
ES2338893-013	SOUUS	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.484	0.495	2.2	0% - 20%
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.005	0.005	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	1.22	1.17	4.0	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5419200)									
ES2338279-001	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2338771-012	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5419201)									
ES2338893-009	KEMUS	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2339034-001	Anonymous	EG035T: 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: 5421261)									
ES2338789-012	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.01	0.02	0.0	No Limit
ES2338893-007	HINUS	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.13	0.13	0.0	0% - 50%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 5418046)									



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 (%)
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 5418046) - continued									
ES2338789-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2338789-010	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.14	0.14	0.0	0% - 50%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 5418048)									
ES2338893-006	HINDS	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2339032-003	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.04	0.04	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 5421262)									
ES2338789-012	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	7.26	7.27	0.2	0% - 20%
ES2338893-007	HINUS	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.01	0.02	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 5421257)									
ES2338893-008	KEMDS	EK061G: Total Kjeldahl Nitrogen as N	----	0.1 (0.2)*	mg/L	1.9	1.9	0.0	No Limit
ES2338893-012	SOU DS	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	2.2	2.1	0.0	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 5421255)									
ES2338771-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2338893-008	KEMDS	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.76	0.76	0.0	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 5421258)									
ES2338893-012	SOU DS	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.09	0.08	0.0	No Limit
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 5418047)									
ES2338893-010	ROPDS	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.02	0.02	0.0	No Limit
ES2338893-006	HINDS	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP074D: Fumigants (QC Lot: 5422345)									
ES2338893-001	BADDS	EP074: 2,2-Dichloropropane	594-20-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1,2-Dichloropropane	78-87-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1,3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1,3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1,2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	0.0	No Limit
ES2338893-011	ROPUS	EP074: 2,2-Dichloropropane	594-20-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1,2-Dichloropropane	78-87-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1,3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1,3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1,2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	0.0	No Limit
EP074E: Halogenated Aliphatic Compounds (QC Lot: 5422345)									
ES2338893-001	BADDS	EP074: 1,1-Dichloroethene	75-35-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Iodomethane	74-88-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1,2-Dichloroethene	156-60-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1,1-Dichloroethane	75-34-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1,2-Dichloroethene	156-59-2	5	µg/L	<5	<5	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 (%)
EP074E: Halogenated Aliphatic Compounds (QC Lot: 5422345) - continued									
ES2338893-001	BADD5	EP074: 1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	0.0	No Limit
		EP074: Trichloroethene	79-01-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dibromomethane	74-95-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	0.0	No Limit
		EP074: Tetrachloroethene	127-18-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Pentachloroethane	76-01-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: Hexachlorobutadiene	87-68-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	0.0	No Limit
		EP074: Chloromethane	74-87-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: Vinyl chloride	75-01-4	50	µg/L	<50	<50	0.0	No Limit
ES2338893-011	ROPUS	EP074: Bromomethane	74-83-9	50	µg/L	<50	<50	0.0	No Limit
		EP074: Chloroethane	75-00-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	0.0	No Limit
		EP074: 1.1-Dichloroethene	75-35-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Iodomethane	74-88-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1-Dichloroethane	75-34-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	0.0	No Limit
		EP074: Trichloroethene	79-01-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dibromomethane	74-95-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	0.0	No Limit
		EP074: Tetrachloroethene	127-18-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	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 (%)
EP074E: Halogenated Aliphatic Compounds (QC Lot: 5422345) - continued									
ES2338893-011	ROPUS	EP074: trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Pentachloroethane	76-01-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: Hexachlorobutadiene	87-68-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	0.0	No Limit
		EP074: Chloromethane	74-87-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: Vinyl chloride	75-01-4	50	µg/L	<50	<50	0.0	No Limit
		EP074: Bromomethane	74-83-9	50	µg/L	<50	<50	0.0	No Limit
		EP074: Chloroethane	75-00-3	50	µg/L	<50	<50	0.0	No Limit
EP074: Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	0.0	No Limit		
EP074F: Halogenated Aromatic Compounds (QC Lot: 5422345)									
ES2338893-001	BADDS	EP074: Chlorobenzene	108-90-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromobenzene	108-86-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 2-Chlorotoluene	95-49-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: 4-Chlorotoluene	106-43-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	<5	0.0	No Limit
ES2338893-011	ROPUS	EP074: Chlorobenzene	108-90-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromobenzene	108-86-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 2-Chlorotoluene	95-49-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: 4-Chlorotoluene	106-43-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	<5	0.0	No Limit
EP074G: Trihalomethanes (QC Lot: 5422345)									
ES2338893-001	BADDS	EP074: Chloroform	67-66-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromodichloromethane	75-27-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dibromochloromethane	124-48-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromoform	75-25-2	5	µg/L	<5	<5	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 (%)
EP074G: Trihalomethanes (QC Lot: 5422345) - continued									
ES2338893-011	ROPUS	EP074: Chloroform	67-66-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromodichloromethane	75-27-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dibromochloromethane	124-48-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromoform	75-25-2	5	µg/L	<5	<5	0.0	No Limit
EP075(SIM)A: Phenolic Compounds (QC Lot: 5417740)									
ES2338893-001	BADDS	EP075(SIM): Phenol	108-95-2	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2	µg/L	<2.0	<2.0	0.0	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2	µg/L	<2.0	<2.0	0.0	No Limit
ES2338893-011	ROPUS	EP075(SIM): Phenol	108-95-2	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2	µg/L	<2.0	<2.0	0.0	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2	µg/L	<2.0	<2.0	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 5417740)									
ES2338893-001	BADDS	EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	<1.0	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 (%)		
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 5417740) - continued											
ES2338893-001	BADDS	EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	<1.0	0.0	No Limit		
ES2338893-011	ROPUS	EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit		
		EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	<1.0	0.0	No Limit		
		EP080: BTEXN (QC Lot: 5422344)									
		ES2338893-001	BADDS	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	108-38-3 106-42-3			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		
ES2338893-011	ROPUS	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		



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: BTEXN (QC Lot: 5422344) - continued									
ES2338893-011	ROPUS	EP080: meta- & para-Xylene	108-38-3 106-42-3	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
EP234A: OP Pesticides (QC Lot: 5419645)									
ES2338893-004	COSDS	EP234-1x: Bensulide	741-58-2	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EP234-1x: Methidathion	950-37-8	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EP234-1x: Pyrazophos	13457-18-6	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EP234-1x: Acephate	30560-19-1	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP234-1x: Thiometon	640-15-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP234-1x: Naftalofofos	1491-41-4	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP234-1x: Fosetyl Aluminium	39148-24-8	10	µg/L	<10	<10	0.0	No Limit
		EP234-1x: Formothion	2540-82-1	20	µg/L	<20	<20	0.0	No Limit
EP2315727-001	Anonymous	EP234-1x: Bensulide	741-58-2	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EP234-1x: Methidathion	950-37-8	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EP234-1x: Pyrazophos	13457-18-6	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EP234-1x: Acephate	30560-19-1	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP234-1x: Thiometon	640-15-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP234-1x: Naftalofofos	1491-41-4	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP234-1x: Fosetyl Aluminium	39148-24-8	10	µg/L	<10	<10	0.0	No Limit
		EP234-1x: Formothion	2540-82-1	20	µg/L	<20	<20	0.0	No Limit
EP234A: OP Pesticides (QC Lot: 5419646)									
ES2338893-004	COSDS	EP234-1: Sulfotep	3689-24-5	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP234-1: Triazophos	24017-47-8	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP234-1: Coumaphos	56-72-4	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Diazinon	333-41-5	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Ethoprophos	13194-48-4	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Fenamiphos	22224-92-6	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Fensulfothion	115-90-2	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Omethoate	1113-02-6	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Pirimiphos-ethyl	23505-41-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Pirimiphos-methyl	29232-93-7	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Profenofos	41198-08-7	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Terbufos	13071-79-9	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Tetrachlorvinphos	22248-79-9	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Azinphos-methyl	86-50-0	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Azinphos-ethyl	2642-71-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Carbofenothion	786-19-6	0.02	µg/L	<0.02	<0.02	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 (%)
EP234A: OP Pesticides (QC Lot: 5419646) - continued									
ES2338893-004	COSDS	EP234-1: Chlorfenvinphos	470-90-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Chlorpyrifos	2921-88-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Demeton-O	298-03-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Demeton-O & Demeton-S	298-03-3/126-75-0	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Demeton-S	126-75-0	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Demeton-S-methyl	919-86-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Dimethoate	60-51-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Ethion	563-12-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Malathion	121-75-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Mevinphos	7786-34-7	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Monocrotophos	6923-22-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Temephos	3383-96-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Trichlorfon	52-68-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Disulfoton	298-04-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP234-1: EPN	2104-64-5	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP234-1: Fenthion	55-38-9	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP234-1: Sulprofos	35400-43-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP234-1: Bromophos-ethyl	4824-78-6	0.1	µg/L	<0.10	<0.10	0.0	No Limit
		EP234-1: Phorate	298-02-2	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EP234-1: Prothiofos	34643-46-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EP234-1: Chlorpyrifos-methyl	5598-13-0	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EP234-1: Dichlorvos	62-73-7	0.2	µg/L	<0.20	<0.20	0.0	No Limit
		EP234-1: Parathion	56-38-2	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EP234-1: Parathion-methyl	298-00-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP234-1: Trichloronate	327-98-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP234-1: Fenchlorphos (Ronnell)	299-84-3	10	µg/L	<10	<10	0.0	No Limit
		EP234-1: Fenitrothion	122-14-5	2	µg/L	<2	<2	0.0	No Limit
EP2315727-001	Anonymous	EP234-1: Sulfotep	3689-24-5	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP234-1: Triazophos	24017-47-8	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP234-1: Coumaphos	56-72-4	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Diazinon	333-41-5	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Ethoprophos	13194-48-4	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Fenamiphos	22224-92-6	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Fensulfothion	115-90-2	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Omethoate	1113-02-6	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Pirimiphos-ethyl	23505-41-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Pirimiphos-methyl	29232-93-7	0.01	µg/L	<0.01	<0.01	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 (%)
EP234A: OP Pesticides (QC Lot: 5419646) - continued									
EP2315727-001	Anonymous	EP234-1: Profenofos	41198-08-7	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Terbufos	13071-79-9	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Tetrachlorvinphos	22248-79-9	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP234-1: Azinphos-methyl	86-50-0	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Azinphos-ethyl	2642-71-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Carbofenthion	786-19-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Chlorfenvinphos	470-90-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Chlorpyrifos	2921-88-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Demeton-O	298-03-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Demeton-O & Demeton-S	298-03-3/126-75-0	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Demeton-S	126-75-0	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Demeton-S-methyl	919-86-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Dimethoate	60-51-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Ethion	563-12-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Malathion	121-75-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Mevinphos	7786-34-7	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Monocrotophos	6923-22-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Temephos	3383-96-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Trichlorfon	52-68-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP234-1: Disulfoton	298-04-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP234-1: EPN	2104-64-5	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP234-1: Fenthion	55-38-9	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP234-1: Sulprofos	35400-43-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP234-1: Bromophos-ethyl	4824-78-6	0.1	µg/L	<0.10	<0.10	0.0	No Limit
		EP234-1: Phorate	298-02-2	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EP234-1: Prothiofos	34643-46-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EP234-1: Chlorpyrifos-methyl	5598-13-0	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EP234-1: Dichlorvos	62-73-7	0.2	µg/L	<0.20	<0.20	0.0	No Limit
		EP234-1: Parathion	56-38-2	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EP234-1: Parathion-methyl	298-00-0	0.5 (2.0)*	µg/L	<2.0	<2.0	0.0	No Limit
		EP234-1: Trichloronate	327-98-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP234-1: Fenchlorphos (Ronnell)	299-84-3	10	µg/L	<10	<10	0.0	No Limit
		EP234-1: Fenitrothion	122-14-5	2	µg/L	<2	<2	0.0	No Limit

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 Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 5423626)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	96.3	87.0	109
				<10	293 mg/L	105	75.2	126
				<10	2470 mg/L	98.6	83.0	124
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 5423627)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	99.0	83.0	129
				<5	1000 mg/L	94.6	82.0	110
				<5	841 mg/L	95.5	83.0	118
EG020T: Total Metals by ICP-MS (QCLot: 5419195)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	102	82.0	114
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	99.8	84.0	112
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	98.8	86.0	116
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	95.6	83.0	118
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	96.7	85.0	115
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	97.0	85.0	113
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	98.5	84.0	116
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	97.8	79.0	117
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	99.5	85.0	117
EG020T: Total Metals by ICP-MS (QCLot: 5419196)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	105	82.0	114
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	104	84.0	112
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	99.7	86.0	116
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	97.5	83.0	118
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	99.3	85.0	115
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	98.5	85.0	113
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	102	84.0	116
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	100	79.0	117
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	102	85.0	117
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5419200)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	84.5	77.0	111
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5419201)								



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5419201) - continued								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	99.6	77.0	111
EK055G: Ammonia as N by Discrete Analyser (QCLot: 5421261)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	98.3	90.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5418046)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	100	82.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5418048)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	101	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5421262)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	101	91.0	113
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5421257)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	73.5	69.0	101
				<0.1	1 mg/L	112	70.0	118
				<0.1	5 mg/L	94.3	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5421255)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	87.0	71.3	126
				<0.01	0.442 mg/L	82.4	71.3	126
				<0.01	1 mg/L	95.8	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5421258)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	85.2	71.3	126
				<0.01	0.442 mg/L	95.5	71.3	126
				<0.01	1 mg/L	95.8	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 5418047)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	104	85.0	117
EP008: Chlorophyll (QCLot: 5418362)								
EP008: Chlorophyll a	----	1	mg/m³	<1	20 mg/m³	97.6	70.0	130
EP020: Oil and Grease (O&G) (QCLot: 5424395)								
EP020: Oil & Grease	----	5	mg/L	<5	5000 mg/L	98.2	81.0	121
				<5	4000 mg/L	98.6	70.0	110
EP074D: Fumigants (QCLot: 5422345)								
EP074: 2,2-Dichloropropane	594-20-7	5	µg/L	<5	10 µg/L	99.8	68.0	122
EP074: 1,2-Dichloropropane	78-87-5	5	µg/L	<5	10 µg/L	96.7	76.0	118
EP074: cis-1,3-Dichloropropylene	10061-01-5	5	µg/L	<5	10 µg/L	94.0	62.0	120
EP074: trans-1,3-Dichloropropylene	10061-02-6	5	µg/L	<5	10 µg/L	96.7	60.0	114
EP074: 1,2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	10 µg/L	99.5	69.0	117



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
EP074E: Halogenated Aliphatic Compounds (QCLot: 5422345)								
EP074: Dichlorodifluoromethane	75-71-8	50	µg/L	<50	100 µg/L	60.6	60.6	138
EP074: Chloromethane	74-87-3	50	µg/L	<50	100 µg/L	78.5	67.4	130
EP074: Vinyl chloride	75-01-4	50	µg/L	<50	100 µg/L	71.8	69.4	129
EP074: Bromomethane	74-83-9	50	µg/L	<50	100 µg/L	83.5	56.0	140
EP074: Chloroethane	75-00-3	50	µg/L	<50	100 µg/L	83.9	61.0	139
EP074: Trichlorofluoromethane	75-69-4	50	µg/L	<50	100 µg/L	89.6	69.0	131
EP074: 1,1-Dichloroethene	75-35-4	5	µg/L	<5	10 µg/L	92.0	70.0	124
EP074: Iodomethane	74-88-4	5	µg/L	<5	10 µg/L	76.6	70.2	128
EP074: trans-1,2-Dichloroethene	156-60-5	5	µg/L	<5	10 µg/L	95.0	74.0	118
EP074: 1,1-Dichloroethane	75-34-3	5	µg/L	<5	10 µg/L	94.8	74.0	120
EP074: cis-1,2-Dichloroethene	156-59-2	5	µg/L	<5	10 µg/L	98.3	77.0	119
EP074: 1,1,1-Trichloroethane	71-55-6	5	µg/L	<5	10 µg/L	94.9	67.0	119
EP074: 1,1-Dichloropropylene	563-58-6	5	µg/L	<5	10 µg/L	95.3	73.0	119
EP074: Carbon Tetrachloride	56-23-5	5	µg/L	<5	10 µg/L	93.4	62.0	120
EP074: 1,2-Dichloroethane	107-06-2	5	µg/L	<5	10 µg/L	100	73.0	123
EP074: Trichloroethene	79-01-6	5	µg/L	<5	10 µg/L	96.2	76.0	118
EP074: Dibromomethane	74-95-3	5	µg/L	<5	10 µg/L	98.3	73.0	119
EP074: 1,1,2-Trichloroethane	79-00-5	5	µg/L	<5	10 µg/L	103	72.0	126
EP074: 1,3-Dichloropropane	142-28-9	5	µg/L	<5	10 µg/L	101	71.0	129
EP074: Tetrachloroethene	127-18-4	5	µg/L	<5	10 µg/L	99.2	72.0	124
EP074: 1,1,1,2-Tetrachloroethane	630-20-6	5	µg/L	<5	10 µg/L	97.8	66.0	114
EP074: trans-1,4-Dichloro-2-butene	110-57-6	5	µg/L	<5	10 µg/L	102	60.0	120
EP074: cis-1,4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	10 µg/L	99.7	70.6	128
EP074: 1,1,2,2-Tetrachloroethane	79-34-5	5	µg/L	<5	10 µg/L	105	70.0	124
EP074: 1,2,3-Trichloropropane	96-18-4	5	µg/L	<5	10 µg/L	108	74.0	126
EP074: Pentachloroethane	76-01-7	5	µg/L	<5	10 µg/L	98.0	71.8	126
EP074: 1,2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	10 µg/L	95.7	66.4	136
EP074: Hexachlorobutadiene	87-68-3	5	µg/L	<5	10 µg/L	101	58.0	130
EP074F: Halogenated Aromatic Compounds (QCLot: 5422345)								
EP074: Chlorobenzene	108-90-7	5	µg/L	<5	10 µg/L	102	79.0	117
EP074: Bromobenzene	108-86-1	5	µg/L	<5	10 µg/L	101	76.0	116
EP074: 2-Chlorotoluene	95-49-8	5	µg/L	<5	10 µg/L	103	73.0	119
EP074: 4-Chlorotoluene	106-43-4	5	µg/L	<5	10 µg/L	103	73.0	119
EP074: 1,3-Dichlorobenzene	541-73-1	5	µg/L	<5	10 µg/L	107	75.0	117



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
EP074F: Halogenated Aromatic Compounds (QCLot: 5422345) - continued								
EP074: 1,4-Dichlorobenzene	106-46-7	5	µg/L	<5	10 µg/L	106	74.0	118
EP074: 1,2-Dichlorobenzene	95-50-1	5	µg/L	<5	10 µg/L	103	75.0	117
EP074: 1,2,4-Trichlorobenzene	120-82-1	5	µg/L	<5	10 µg/L	104	61.0	125
EP074: 1,2,3-Trichlorobenzene	87-61-6	5	µg/L	<5	10 µg/L	106	67.0	123
EP074G: Trihalomethanes (QCLot: 5422345)								
EP074: Chloroform	67-66-3	5	µg/L	<5	10 µg/L	101	72.0	120
EP074: Bromodichloromethane	75-27-4	5	µg/L	<5	10 µg/L	94.3	64.0	118
EP074: Dibromochloromethane	124-48-1	5	µg/L	<5	10 µg/L	94.8	65.0	115
EP074: Bromoform	75-25-2	5	µg/L	<5	10 µg/L	94.8	73.5	126
EP075(SIM)A: Phenolic Compounds (QCLot: 5417740)								
EP075(SIM): Phenol	108-95-2	1	µg/L	<1.0	5 µg/L	32.8	24.5	61.9
EP075(SIM): 2-Chlorophenol	95-57-8	1	µg/L	<1.0	5 µg/L	70.3	52.0	90.0
EP075(SIM): 2-Methylphenol	95-48-7	1	µg/L	<1.0	5 µg/L	67.9	51.0	91.0
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2	µg/L	<2.0	10 µg/L	64.4	44.0	88.0
EP075(SIM): 2-Nitrophenol	88-75-5	1	µg/L	<1.0	5 µg/L	77.0	48.0	100
EP075(SIM): 2,4-Dimethylphenol	105-67-9	1	µg/L	<1.0	5 µg/L	72.0	49.0	99.0
EP075(SIM): 2,4-Dichlorophenol	120-83-2	1	µg/L	<1.0	5 µg/L	72.7	53.0	105
EP075(SIM): 2,6-Dichlorophenol	87-65-0	1	µg/L	<1.0	5 µg/L	75.3	57.0	105
EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	1	µg/L	<1.0	5 µg/L	73.5	53.0	99.0
EP075(SIM): 2,4,6-Trichlorophenol	88-06-2	1	µg/L	<1.0	5 µg/L	76.3	50.0	106
EP075(SIM): 2,4,5-Trichlorophenol	95-95-4	1	µg/L	<1.0	5 µg/L	69.4	51.0	105
EP075(SIM): Pentachlorophenol	87-86-5	2	µg/L	<2.0	10 µg/L	48.0	10.0	95.0
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5417740)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	70.6	50.0	94.0
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	74.1	63.6	114
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	75.2	62.2	113
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	72.3	63.9	115
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	76.5	62.6	116
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	77.8	64.3	116
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	78.0	63.6	118
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	79.4	63.1	118
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	71.1	64.1	117
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	75.1	62.5	116



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5417740) - continued								
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	1	µg/L	<1.0	5 µg/L	74.9	61.7	119
	205-82-3							
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	72.2	63.0	115
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	73.1	63.3	117
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	72.3	59.9	118
EP075(SIM): Dibenz(a,h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	72.4	61.2	117
EP075(SIM): Benzo(g,h,i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	73.4	59.1	118
EP080: BTEXN (QCLot: 5422344)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	79.9	68.3	119
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	73.6	73.5	120
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	77.7	73.8	122
EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	10 µg/L	81.9	73.0	122
	106-42-3							
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	83.3	76.4	123
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	87.8	75.5	124
EP234A: OP Pesticides (QCLot: 5419645)								
EP234-1x: Acephate	30560-19-1	0.5	µg/L	<0.5	5 µg/L	96.4	70.0	130
EP234-1x: Bensulide	741-58-2	0.1	µg/L	<0.1	5 µg/L	93.1	70.0	130
EP234-1x: Formothion	2540-82-1	20	µg/L	<20	-----	-----	-----	-----
EP234-1x: Fosetyl Aluminium	39148-24-8	10	µg/L	<10	5 µg/L	111	70.0	130
EP234-1x: Methidathion	950-37-8	0.1	µg/L	<0.1	5 µg/L	90.7	70.0	130
EP234-1x: Naftalofos	1491-41-4	1	µg/L	<1.0	5 µg/L	93.4	70.0	130
EP234-1x: Pyrazophos	13457-18-6	0.1	µg/L	<0.1	5 µg/L	99.4	70.0	130
EP234-1x: Thiometon	640-15-3	0.5	µg/L	<0.5	5 µg/L	108	70.0	130
EP234A: OP Pesticides (QCLot: 5419646)								
EP234-1: Azinphos-methyl	86-50-0	0.02	µg/L	<0.02	0.2 µg/L	113	77.0	129
EP234-1: Azinphos-ethyl	2642-71-9	0.02	µg/L	<0.02	0.2 µg/L	93.0	75.0	135
EP234-1: Bromophos-ethyl	4824-78-6	0.1	µg/L	<0.10	1 µg/L	130	70.0	130
EP234-1: Carbofenothion	786-19-6	0.02	µg/L	<0.02	0.2 µg/L	121	70.0	130
EP234-1: Chlorfenvinphos	470-90-6	0.02	µg/L	<0.02	0.2 µg/L	92.6	74.0	134
EP234-1: Chlorpyrifos	2921-88-2	0.02	µg/L	<0.02	0.2 µg/L	96.0	70.0	130
EP234-1: Chlorpyrifos-methyl	5598-13-0	0.2	µg/L	<0.2	2 µg/L	108	70.0	130
EP234-1: Coumaphos	56-72-4	0.01	µg/L	<0.01	0.1 µg/L	94.6	70.0	130
EP234-1: Demeton-O	298-03-3	0.02	µg/L	<0.02	0.05 µg/L	90.2	64.0	134



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
EP234A: OP Pesticides (QCLot: 5419646) - continued								
EP234-1: Demeton-O & Demeton-S	298-03-3/12 6-75-0	0.02	µg/L	<0.02	0.1 µg/L	96.9	79.0	127
EP234-1: Demeton-S	126-75-0	0.02	µg/L	<0.02	0.05 µg/L	104	63.0	135
EP234-1: Demeton-S-methyl	919-86-8	0.02	µg/L	<0.02	0.2 µg/L	92.2	70.0	128
EP234-1: Diazinon	333-41-5	0.01	µg/L	<0.01	0.1 µg/L	95.3	68.0	138
EP234-1: Dichlorvos	62-73-7	0.2	µg/L	<0.20	2 µg/L	80.6	76.0	128
EP234-1: Dimethoate	60-51-5	0.02	µg/L	<0.02	0.2 µg/L	97.6	75.0	127
EP234-1: Disulfoton	298-04-4	0.05	µg/L	<0.05	0.5 µg/L	90.0	72.0	134
EP234-1: EPN	2104-64-5	0.05	µg/L	<0.05	0.5 µg/L	117	70.0	130
EP234-1: Ethion	563-12-2	0.02	µg/L	<0.02	0.2 µg/L	100	70.0	130
EP234-1: Ethoprophos	13194-48-4	0.01	µg/L	<0.01	0.1 µg/L	99.8	78.0	128
EP234-1: Fenamiphos	22224-92-6	0.01	µg/L	<0.01	0.1 µg/L	96.4	71.0	135
EP234-1: Fenchlorphos (Ronnel)	299-84-3	10	µg/L	<10	100 µg/L	104	70.0	130
EP234-1: Fenitrothion	122-14-5	2	µg/L	<2	20 µg/L	103	64.0	136
EP234-1: Fensulfothion	115-90-2	0.01	µg/L	<0.01	0.1 µg/L	89.8	79.0	125
EP234-1: Fenthion	55-38-9	0.05	µg/L	<0.05	0.5 µg/L	92.5	70.0	130
EP234-1: Malathion	121-75-5	0.02	µg/L	<0.02	0.2 µg/L	95.6	70.0	130
EP234-1: Mevinphos	7786-34-7	0.02	µg/L	<0.02	0.2 µg/L	95.6	77.0	123
EP234-1: Monocrotophos	6923-22-4	0.02	µg/L	<0.02	0.2 µg/L	99.8	75.0	129
EP234-1: Omethoate	1113-02-6	0.01	µg/L	<0.01	0.1 µg/L	94.6	74.0	130
EP234-1: Parathion	56-38-2	0.2	µg/L	<0.2	2 µg/L	93.4	69.0	139
EP234-1: Parathion-methyl	298-00-0	0.5	µg/L	<0.5	20 µg/L	93.0	66.0	140
EP234-1: Phorate	298-02-2	0.1	µg/L	<0.1	1 µg/L	94.8	68.0	136
EP234-1: Pirimiphos-ethyl	23505-41-1	0.01	µg/L	<0.01	0.1 µg/L	96.3	70.0	130
EP234-1: Pirimiphos-methyl	29232-93-7	0.01	µg/L	<0.01	0.1 µg/L	91.4	71.0	137
EP234-1: Profenofos	41198-08-7	0.01	µg/L	<0.01	0.1 µg/L	103	70.0	130
EP234-1: Prothiofos	34643-46-4	0.1	µg/L	<0.1	1 µg/L	82.0	70.0	130
EP234-1: Sulfotep	3689-24-5	0.005	µg/L	<0.005	0.05 µg/L	103	71.0	137
EP234-1: Sulprofos	35400-43-2	0.05	µg/L	<0.05	0.5 µg/L	124	70.0	130
EP234-1: Temephos	3383-96-8	0.02	µg/L	<0.02	0.2 µg/L	104	70.0	130
EP234-1: Terbufos	13071-79-9	0.01	µg/L	<0.01	0.1 µg/L	85.6	70.0	130
EP234-1: Tetrachlorvinphos	22248-79-9	0.01	µg/L	<0.01	0.1 µg/L	104	74.0	128
EP234-1: Triazophos	24017-47-8	0.005	µg/L	<0.005	0.05 µg/L	98.6	77.0	131
EP234-1: Trichlorfon	52-68-6	0.02	µg/L	<0.02	0.2 µg/L	99.4	70.0	130
EP234-1: Trichloronate	327-98-0	0.5	µg/L	<0.5	5 µg/L	132	63.0	139



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**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 5419195)							
ES2338152-002	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	96.6	70.0	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	95.6	70.0	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	93.5	70.0	130
		EG020A-T: Copper	7440-50-8	1 mg/L	93.0	70.0	130
		EG020A-T: Lead	7439-92-1	1 mg/L	99.0	70.0	130
		EG020A-T: Manganese	7439-96-5	1 mg/L	90.8	70.0	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	95.7	70.0	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	94.9	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 5419196)							
ES2338893-004	COSDS	EG020A-T: Arsenic	7440-38-2	1 mg/L	123	70.0	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	118	70.0	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	115	70.0	130
		EG020A-T: Copper	7440-50-8	1 mg/L	114	70.0	130
		EG020A-T: Lead	7439-92-1	1 mg/L	119	70.0	130
		EG020A-T: Manganese	7439-96-5	1 mg/L	108	70.0	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	118	70.0	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	117	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5419200)							
ES2338279-002	Anonymous	EG035T: Mercury	7439-97-6	0.01 mg/L	82.2	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5419201)							
ES2338893-010	ROPDS	EG035T: Mercury	7439-97-6	0.01 mg/L	70.7	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 5421261)							
ES2338789-012	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	99.5	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5418046)							
ES2338789-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	106	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5418048)							
ES2338893-006	HINDS	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	108	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5421262)							
ES2338789-012	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	# Not Determined	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5421257)							
ES2338893-013	SOUUS	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	86.2	70.0	130

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5421255)							
ES2338771-002	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	89.0	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5421258)							
ES2338893-013	SOUUS	EK067G: Total Phosphorus as P	----	1 mg/L	90.0	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 5418047)							
ES2338893-006	HINDS	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	104	70.0	130
EP074E: Halogenated Aliphatic Compounds (QCLot: 5422345)							
ES2338893-001	BADDS	EP074: 1.1-Dichloroethene	75-35-4	50 µg/L	107	70.0	130
		EP074: Trichloroethene	79-01-6	50 µg/L	81.3	70.0	130
EP074F: Halogenated Aromatic Compounds (QCLot: 5422345)							
ES2338893-001	BADDS	EP074: Chlorobenzene	108-90-7	50 µg/L	78.8	70.0	130
EP075(SIM)A: Phenolic Compounds (QCLot: 5417740)							
ES2338893-002	BADMS	EP075(SIM): Phenol	108-95-2	20 µg/L	32.8	20.0	130
		EP075(SIM): 2-Chlorophenol	95-57-8	20 µg/L	76.0	60.0	130
		EP075(SIM): 2-Nitrophenol	88-75-5	20 µg/L	89.3	60.0	130
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	20 µg/L	75.3	70.0	130
		EP075(SIM): Pentachlorophenol	87-86-5	20 µg/L	43.0	20.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5417740)							
ES2338893-002	BADMS	EP075(SIM): Acenaphthene	83-32-9	20 µg/L	75.9	70.0	130
		EP075(SIM): Pyrene	129-00-0	20 µg/L	77.6	70.0	130
EP080: BTEXN (QCLot: 5422344)							
ES2338893-001	BADDS	EP080: Benzene	71-43-2	25 µg/L	105	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	102	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	108	70.0	130
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	115	70.0	130
			106-42-3				
		EP080: ortho-Xylene	95-47-6	25 µg/L	118	70.0	130
	EP080: Naphthalene	91-20-3	25 µg/L	117	70.0	130	
EP234A: OP Pesticides (QCLot: 5419645)							
EP2315727-001	Anonymous	EP234-1x: Acephate	30560-19-1	5 µg/L	93.1	70.0	130
		EP234-1x: Bensulide	741-58-2	5 µg/L	87.3	70.0	130
		EP234-1x: Fosetyl Aluminium	39148-24-8	5 µg/L	115	70.0	130
		EP234-1x: Methidathion	950-37-8	5 µg/L	106	70.0	130
		EP234-1x: Naftalofos	1491-41-4	5 µg/L	102	70.0	130
		EP234-1x: Pyrazophos	13457-18-6	5 µg/L	113	70.0	130
		EP234-1x: Thiometon	640-15-3	5 µg/L	# 68.0	70.0	130
EP234A: OP Pesticides (QCLot: 5419646)							



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP234A: OP Pesticides (QCLot: 5419646) - continued							
EP2315727-001	Anonymous	EP234-1: Azinphos-methyl	86-50-0	0.2 µg/L	96.8	70.0	130
		EP234-1: Azinphos-ethyl	2642-71-9	0.2 µg/L	93.4	70.0	130
		EP234-1: Bromophos-ethyl	4824-78-6	1 µg/L	122	70.0	130
		EP234-1: Carbofenothion	786-19-6	0.2 µg/L	127	70.0	130
		EP234-1: Chlorfenvinphos	470-90-6	0.2 µg/L	97.7	70.0	130
		EP234-1: Chlorpyrifos	2921-88-2	0.2 µg/L	98.0	70.0	130
		EP234-1: Chlorpyrifos-methyl	5598-13-0	2 µg/L	100	58.0	136
		EP234-1: Coumaphos	56-72-4	0.1 µg/L	92.3	70.0	130
		EP234-1: Demeton-O	298-03-3	0.05 µg/L	94.8	70.0	130
		EP234-1: Demeton-O & Demeton-S	298-03-3/126-75-0	0.1 µg/L	99.5	69.0	129
		EP234-1: Demeton-S	126-75-0	0.05 µg/L	104	70.0	130
		EP234-1: Demeton-S-methyl	919-86-8	0.2 µg/L	95.8	70.0	130
		EP234-1: Diazinon	333-41-5	0.1 µg/L	93.4	70.0	130
		EP234-1: Dichlorvos	62-73-7	2 µg/L	89.8	70.0	130
		EP234-1: Dimethoate	60-51-5	0.2 µg/L	82.0	69.0	131
		EP234-1: Disulfoton	298-04-4	0.5 µg/L	90.2	70.0	130
		EP234-1: EPN	2104-64-5	0.5 µg/L	119	70.0	130
		EP234-1: Ethion	563-12-2	0.2 µg/L	95.8	70.0	130
		EP234-1: Ethoprophos	13194-48-4	0.1 µg/L	89.9	70.0	132
		EP234-1: Fenamiphos	22224-92-6	0.1 µg/L	98.1	70.0	130
		EP234-1: Fenchlorphos (Ronnell)	299-84-3	100 µg/L	98.7	71.0	133
		EP234-1: Fenitrothion	122-14-5	20 µg/L	108	64.0	136
		EP234-1: Fensulfotthion	115-90-2	0.1 µg/L	96.3	83.0	123
		EP234-1: Fenthion	55-38-9	0.5 µg/L	93.5	70.0	130
		EP234-1: Malathion	121-75-5	0.2 µg/L	96.3	70.0	130
		EP234-1: Mevinphos	7786-34-7	0.2 µg/L	100	69.0	125
		EP234-1: Monocrotophos	6923-22-4	0.2 µg/L	111	70.0	128
		EP234-1: Omethoate	1113-02-6	0.1 µg/L	89.1	70.0	130
		EP234-1: Parathion	56-38-2	2 µg/L	109	70.0	130
		EP234-1: Parathion-methyl	298-00-0	20 µg/L	104	70.0	140
		EP234-1: Phorate	298-02-2	1 µg/L	100	70.0	130
		EP234-1: Pirimiphos-ethyl	23505-41-1	0.1 µg/L	98.7	70.0	130
		EP234-1: Pirimiphos-methyl	29232-93-7	0.1 µg/L	97.8	70.0	130
		EP234-1: Profenofos	41198-08-7	0.1 µg/L	104	70.0	130
		EP234-1: Prothiofos	34643-46-4	1 µg/L	# 133	70.0	130
		EP234-1: Sulfotep	3689-24-5	0.05 µg/L	92.0	63.0	135
		EP234-1: Sulprofos	35400-43-2	0.5 µg/L	111	70.0	130
		EP234-1: Temephos	3383-96-8	0.2 µg/L	108	70.0	130
		EP234-1: Terbufos	13071-79-9	0.1 µg/L	92.5	70.0	130



Sub-Matrix: WATER				Matrix Spike (MS) Report			
Laboratory sample ID		Sample ID		Spike	SpikeRecovery(%)	Acceptable Limits (%)	
		Method: Compound	CAS Number	Concentration	MS	Low	High
EP234A: OP Pesticides (QCLot: 5419646) - continued							
EP2315727-001	Anonymous	EP234-1: Tetrachlorvinphos	22248-79-9	0.1 µg/L	97.8	77.0	125
		EP234-1: Triazophos	24017-47-8	0.05 µg/L	99.8	74.0	132
		EP234-1: Trichlorfon	52-68-6	0.2 µg/L	96.6	70.0	130
		EP234-1: Trichloronate	327-98-0	5 µg/L	123	63.0	139



QA/QC Compliance Assessment to assist with Quality Review

Work Order : ES2338893

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Amendment : 5

Client : GHD PTY LTD

Contact : MR HENRY LUO

Project : 12554717

Site : ----

Sampler : ANDREW DUVAL, EMILY SMITH

Order number : 12554717

Laboratory : Environmental Division Sydney

Telephone : +61-2-8784 8555

Date Samples Received : 09-Nov-2023

Issue Date : 25-Mar-2024

No. of samples received : 22

No. of samples analysed : 22

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

- **NO** Quality Control Sample Frequency Outliers exist.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	ES2338736--001	Anonymous	Sulfate as SO4 - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Ar	ES2338789--012	Anonymous	Nitrite + Nitrate as N	----	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP234A: OP Pesticides	EP2315727--001	Anonymous	Prothiofos	34643-46-4	133 %	70.0-130%	Recovery greater than upper data quality objective
EP234A: OP Pesticides	EP2315727--001	Anonymous	Thiometon	640-15-3	68.0 %	70.0-130%	Recovery less than lower data quality objective

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.

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			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)		08-Nov-2023	----	----	----	14-Nov-2023	15-Nov-2023	✓
BADDS,	BADMS,							
BADUS,	COSDS,							
COSUS,	HINDS,							
HINUS,	KEMDS,							
KEMUS,	ROPDS,							
ROPUS,	SOUDS,							
SOUUS,	BH104R,							
BH107R,	BH112R							
Clear Plastic Bottle - Natural (EA015H)		09-Nov-2023	----	----	----	14-Nov-2023	16-Nov-2023	✓
BH145R								

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H) BADDs, BADUS, COSUS, HINUS, KEMUS, ROPUS, SOUUS, BH107R, BADMS, COSDS, HINDS, KEMDS, ROPDS, SOUDS, BH104R, BH112R	08-Nov-2023	----	----	----	14-Nov-2023	15-Nov-2023	✓
Clear Plastic Bottle - Natural (EA025H) BH145R	09-Nov-2023	----	----	----	14-Nov-2023	16-Nov-2023	✓
EA065: Total Hardness as CaCO3							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BH104R, BH112R	08-Nov-2023	----	----	----	14-Nov-2023	06-Dec-2023	✓
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BH145R	09-Nov-2023	----	----	----	14-Nov-2023	07-Dec-2023	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) BH104R, BH112R	08-Nov-2023	----	----	----	13-Nov-2023	22-Nov-2023	✓
Clear Plastic Bottle - Natural (ED037-P) BH145R	09-Nov-2023	----	----	----	13-Nov-2023	23-Nov-2023	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) BH104R, BH112R	08-Nov-2023	----	----	----	10-Nov-2023	06-Dec-2023	✓
Clear Plastic Bottle - Natural (ED041G) BH145R	09-Nov-2023	----	----	----	11-Nov-2023	07-Dec-2023	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) BH104R, BH112R	08-Nov-2023	----	----	----	10-Nov-2023	06-Dec-2023	✓
Clear Plastic Bottle - Natural (ED045G) BH145R	09-Nov-2023	----	----	----	11-Nov-2023	07-Dec-2023	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BH104R, BH112R	08-Nov-2023	----	----	----	14-Nov-2023	06-Dec-2023	✓
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BH145R	09-Nov-2023	----	----	----	14-Nov-2023	07-Dec-2023	✓



Matrix: WATER

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) BH104R, BH112R,	BH107R, GWDUP1	08-Nov-2023	----	----	----	14-Nov-2023	06-May-2024	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) BH145R		09-Nov-2023	----	----	----	14-Nov-2023	07-May-2024	✓
EG020T: Total Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T) BADDS, BADUS, COSUS, HINUS, KEMUS, ROPUS, SOUUS, GWRB1	BADMS, COSDS, HINDS, KEMDS, ROPDS, SOUUS, SWDUP1,	08-Nov-2023	13-Nov-2023	06-May-2024	✓	13-Nov-2023	06-May-2024	✓
EG035F: Dissolved Mercury by FIMS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) BH104R, BH112R,	BH107R, GWDUP1	08-Nov-2023	----	----	----	15-Nov-2023	06-Dec-2023	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) BH145R		09-Nov-2023	----	----	----	15-Nov-2023	07-Dec-2023	✓
EG035T: Total Recoverable Mercury by FIMS								
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG035T) BADDS, BADUS, COSUS, HINUS, KEMUS, ROPUS, SOUUS, GWRB1	BADMS, COSDS, HINDS, KEMDS, ROPDS, SOUUS, SWDUP1,	08-Nov-2023	----	----	----	14-Nov-2023	06-Dec-2023	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EK055G: Ammonia as N by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK055G) BADDS, BADMS, BADUS, COSDS, COSUS, HINDS, HINUS, KEMDS, KEMUS, ROPDS, ROPUS, SOUDS, SOUUS, BH104R, BH107R, BH112R	08-Nov-2023	----	----	----	13-Nov-2023	06-Dec-2023	✓	
Clear Plastic Bottle - Sulfuric Acid (EK055G) BH145R	09-Nov-2023	----	----	----	13-Nov-2023	07-Dec-2023	✓	
EK057G: Nitrite as N by Discrete Analyser								
Clear Plastic Bottle - Natural (EK057G) BADDS, BADMS, BADUS, COSDS, COSUS, HINDS, HINUS, KEMDS, KEMUS, ROPDS, ROPUS, SOUDS, SOUUS, BH104R, BH107R, BH112R	08-Nov-2023	----	----	----	10-Nov-2023	10-Nov-2023	✓	
Clear Plastic Bottle - Natural (EK057G) BH145R	09-Nov-2023	----	----	----	11-Nov-2023	11-Nov-2023	✓	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK059G) BADDS, BADMS, BADUS, COSDS, COSUS, HINDS, HINUS, KEMDS, KEMUS, ROPDS, ROPUS, SOUDS, SOUUS, BH104R, BH107R, BH112R	08-Nov-2023	----	----	----	13-Nov-2023	06-Dec-2023	✓	
Clear Plastic Bottle - Sulfuric Acid (EK059G) BH145R	09-Nov-2023	----	----	----	13-Nov-2023	07-Dec-2023	✓	



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK061G) BADDS, BADMS, BADUS, COSDS, COSUS, HINDS, HINUS, KEMDS, KEMUS, ROPDS, ROPUS, SOUDS, SOUUS, BH104R, BH107R, BH112R		08-Nov-2023	13-Nov-2023	06-Dec-2023	✓	13-Nov-2023	06-Dec-2023	✓
Clear Plastic Bottle - Sulfuric Acid (EK061G) BH145R		09-Nov-2023	13-Nov-2023	07-Dec-2023	✓	13-Nov-2023	07-Dec-2023	✓
EK067G: Total Phosphorus as P by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK067G) BADDS, BADMS, BADUS, COSDS, COSUS, HINDS, HINUS, KEMDS, KEMUS, ROPDS, ROPUS, SOUDS, SOUUS, BH104R, BH107R, BH112R		08-Nov-2023	13-Nov-2023	06-Dec-2023	✓	13-Nov-2023	06-Dec-2023	✓
Clear Plastic Bottle - Sulfuric Acid (EK067G) BH145R		09-Nov-2023	13-Nov-2023	07-Dec-2023	✓	13-Nov-2023	07-Dec-2023	✓
EK071G: Reactive Phosphorus as P by discrete analyser								
Clear Plastic Bottle - Natural (EK071G) BADDS, BADMS, BADUS, COSDS, COSUS, HINDS, HINUS, KEMDS, KEMUS, ROPDS, ROPUS, SOUDS, SOUUS, BH104R, BH107R, BH112R		08-Nov-2023	----	----	----	10-Nov-2023	10-Nov-2023	✓
Clear Plastic Bottle - Natural (EK071G) BH145R		09-Nov-2023	----	----	----	11-Nov-2023	11-Nov-2023	✓

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP008: Chlorophyll a & Pheophytin a								
Opaque Plastic Bottle - Unpreserved (EP008)		08-Nov-2023	----	----	----	10-Nov-2023	10-Nov-2023	✓
BADDS,	BADMS,							
BADUS,	COSDS,							
COSUS,	HINDS,							
HINUS,	KEMDS,							
KEMUS,	ROPDS,							
ROPUS,	SOUUS,							
SOUUS								
EP020: Oil and Grease (O&G)								
Amber Jar - Sulfuric Acid or Sodium Bisulfate (EP020)		08-Nov-2023	----	----	----	15-Nov-2023	06-Dec-2023	✓
BADDS,	BADMS,							
BADUS,	COSDS,							
COSUS,	HINDS,							
HINUS,	KEMDS,							
KEMUS,	ROPDS,							
ROPUS,	SOUUS,							
SOUUS								
EP074D: Fumigants								
Amber VOC Vial - Sulfuric Acid (EP074)		08-Nov-2023	14-Nov-2023	22-Nov-2023	✓	14-Nov-2023	22-Nov-2023	✓
BADDS,	BADMS,							
BADUS,	COSDS,							
COSUS,	HINDS,							
HINUS,	KEMDS							
Amber VOC Vial - Sulfuric Acid (EP074)		08-Nov-2023	14-Nov-2023	22-Nov-2023	✓	15-Nov-2023	22-Nov-2023	✓
KEMUS,	ROPDS,							
ROPUS,	SOUUS,							
SOUUS								
EP074E: Halogenated Aliphatic Compounds								
Amber VOC Vial - Sulfuric Acid (EP074)		08-Nov-2023	14-Nov-2023	22-Nov-2023	✓	14-Nov-2023	22-Nov-2023	✓
BADDS,	BADMS,							
BADUS,	COSDS,							
COSUS,	HINDS,							
HINUS,	KEMDS							
Amber VOC Vial - Sulfuric Acid (EP074)		08-Nov-2023	14-Nov-2023	22-Nov-2023	✓	15-Nov-2023	22-Nov-2023	✓
KEMUS,	ROPDS,							
ROPUS,	SOUUS,							
SOUUS								

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP074F: Halogenated Aromatic Compounds								
Amber VOC Vial - Sulfuric Acid (EP074)		08-Nov-2023	14-Nov-2023	22-Nov-2023	✓	14-Nov-2023	22-Nov-2023	✓
BADDS, BADUS, COSUS, HINUS,	BADMS, COSDS, HINDS, KEMDS							
Amber VOC Vial - Sulfuric Acid (EP074)		08-Nov-2023	14-Nov-2023	22-Nov-2023	✓	15-Nov-2023	22-Nov-2023	✓
KEMUS, ROPUS, SOUUS	ROPDS, SOUUS,							
EP074G: Trihalomethanes								
Amber VOC Vial - Sulfuric Acid (EP074)		08-Nov-2023	14-Nov-2023	22-Nov-2023	✓	14-Nov-2023	22-Nov-2023	✓
BADDS, BADUS, COSUS, HINUS,	BADMS, COSDS, HINDS, KEMDS							
Amber VOC Vial - Sulfuric Acid (EP074)		08-Nov-2023	14-Nov-2023	22-Nov-2023	✓	15-Nov-2023	22-Nov-2023	✓
KEMUS, ROPUS, SOUUS	ROPDS, SOUUS,							
EP075(SIM)A: Phenolic Compounds								
Amber Glass Bottle - Unpreserved (EP075(SIM))		08-Nov-2023	13-Nov-2023	15-Nov-2023	✓	14-Nov-2023	23-Dec-2023	✓
BADDS, BADUS, COSUS, HINUS, KEMUS, ROPUS, SOUUS	BADMS, COSDS, HINDS, KEMDS, ROPDS, SOUUS,							
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP075(SIM))		08-Nov-2023	13-Nov-2023	15-Nov-2023	✓	14-Nov-2023	23-Dec-2023	✓
BADDS, BADUS, COSUS, HINUS, KEMUS, ROPUS, SOUUS	BADMS, COSDS, HINDS, KEMDS, ROPDS, SOUUS,							



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071) BH104R, BH112R	BH107R,	08-Nov-2023	13-Nov-2023	15-Nov-2023	✔	16-Nov-2023	23-Dec-2023	✔
Amber Glass Bottle - Unpreserved (EP071) BH145R		09-Nov-2023	13-Nov-2023	16-Nov-2023	✔	16-Nov-2023	23-Dec-2023	✔
Amber VOC Vial - Sulfuric Acid (EP080) BH104R, BH112R	BH107R,	08-Nov-2023	14-Nov-2023	22-Nov-2023	✔	15-Nov-2023	22-Nov-2023	✔
Amber VOC Vial - Sulfuric Acid (EP080) BH145R		09-Nov-2023	14-Nov-2023	23-Nov-2023	✔	15-Nov-2023	23-Nov-2023	✔
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071) BH104R, BH112R	BH107R,	08-Nov-2023	13-Nov-2023	15-Nov-2023	✔	16-Nov-2023	23-Dec-2023	✔
Amber Glass Bottle - Unpreserved (EP071) BH145R		09-Nov-2023	13-Nov-2023	16-Nov-2023	✔	16-Nov-2023	23-Dec-2023	✔
Amber VOC Vial - Sulfuric Acid (EP080) BH104R, BH112R	BH107R,	08-Nov-2023	14-Nov-2023	22-Nov-2023	✔	15-Nov-2023	22-Nov-2023	✔
Amber VOC Vial - Sulfuric Acid (EP080) BH145R		09-Nov-2023	14-Nov-2023	23-Nov-2023	✔	15-Nov-2023	23-Nov-2023	✔
EP080: BTEXN								
Amber VOC Vial - Sulfuric Acid (EP080) BADDS, BADUS, COSUS, HINUS,	BADMS, COSDS, HINDS, KEMDS	08-Nov-2023	14-Nov-2023	22-Nov-2023	✔	14-Nov-2023	22-Nov-2023	✔
Amber VOC Vial - Sulfuric Acid (EP080) KEMUS, ROPUS, SOUUS, BH107R, TRIP SPIKE,	ROPDS, SOUDS, BH104R, BH112R, TRIP BLANK	08-Nov-2023	14-Nov-2023	22-Nov-2023	✔	15-Nov-2023	22-Nov-2023	✔
Amber VOC Vial - Sulfuric Acid (EP080) BH145R		09-Nov-2023	14-Nov-2023	23-Nov-2023	✔	15-Nov-2023	23-Nov-2023	✔

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP234A: OP Pesticides								
Amber Glass Bottle - Unpreserved (EP234-1)		08-Nov-2023	----	----	----	13-Nov-2023	15-Nov-2023	✓
BADDS,	BADMS,							
BADUS,	COSDS,							
COSUS,	HINDS,							
HINUS,	KEMDS,							
KEMUS,	ROPDS,							
ROPUS,	SOUUS,							
SOUUS								



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	10	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	30	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	6	59	10.17	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	2	13	15.38	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by LCMSMS (Positive Ion Mode)	EP234-1	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by LCMSMS (Positive Ion Mode) - extended	EP234-1x	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	4	32	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	30	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	6	55	10.91	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	6	55	10.91	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	4	32	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	26	11.54	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds	EP074	2	13	15.38	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by Auto Titrator	ED037-P	2	10	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	30	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chlorophyll a and Pheophytin a	EP008	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	3	59	5.08	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Oil and Grease	EP020	4	47	8.51	8.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by LCMSMS (Positive Ion Mode)	EP234-1	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by LCMSMS (Positive Ion Mode) - extended	EP234-1x	1	20	5.00	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	
Laboratory Control Samples (LCS) - Continued							
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	32	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	30	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	8	55	14.55	12.50	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	8	55	14.55	12.50	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	20	15.00	15.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	32	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	6	26	23.08	15.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds	EP074	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	30	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chlorophyll a and Pheophytin a	EP008	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	3	59	5.08	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Oil and Grease	EP020	3	47	6.38	6.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by LCMSMS (Positive Ion Mode)	EP234-1	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by LCMSMS (Positive Ion Mode) - extended	EP234-1x	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	32	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	30	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	3	55	5.45	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	3	55	5.45	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	32	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	26	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds	EP074	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	30	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	40	5.00	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	
Matrix Spikes (MS) - Continued							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	3	59	5.08	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by LCMSMS (Positive Ion Mode)	EP234-1	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by LCMSMS (Positive Ion Mode) - extended	EP234-1x	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	32	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	30	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	32	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	26	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds	EP074	1	13	7.69	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)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. 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 thiocyanate forms highly-coloured ferric thiocyanate 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 0.45um 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.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. 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 0.45um 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).



Analytical Methods	Method	Matrix	Method Descriptions
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ 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-NH ₃ 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-NO ₂ - 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-NO ₃ - F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined separately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NO _x) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO ₃ - F. Combined oxidised Nitrogen (NO ₂ +NO ₃) 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-NO ₃ -. 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)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with orthophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO ₄ DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Chlorophyll a and Pheophytin a	EP008	WATER	In house: Referenced to APHA 10200 H. The pigments are extracted into aqueous acetone. The optical density of the extract before and after acidification at both 664 nm and 665 nm is determined spectrometrically.
Oil and Grease	EP020	WATER	In house: Referenced to APHA 5520 B. Oil & grease is a gravimetric procedure to determine the amount of dissolved or emulsified oil & grease residue in an aqueous sample. The sample is serially extracted three times n-hexane. The resultant extracts are combined, dehydrated and concentrated prior to gravimetric determination. 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)



<i>Analytical Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Volatile Organic Compounds	EP074	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. This method is compliant with 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)
Pesticides by LCMSMS (Positive Ion Mode)	EP234-1	WATER	In house: LC-MSMS, direct injection. A sample is filtered and injected directly onto the LC-MSMS. Analysis is by LC/MSMS, ESI Positive Mode.
Pesticides by LCMSMS (Positive Ion Mode) - extended	EP234-1x	WATER	In house: LC-MSMS, direct injection. A sample is filtered and injected directly onto the LC-MSMS. Analysis is by LC/MSMS, ESI Positive Mode.
<i>Preparation Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
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)
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. 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.

CLIENT DETAILS

Page 1 of 1

Company Name : GHD Pty Ltd, Sydney	Contact Name : Emily Smith 0431 522 928	Purchase Order : 12554717	COC Number :
Office Address :	Project Manager: Henry Luo 0414 090 002	PROJECT Number : 12554717	Eurofins mgt quote ID :
Level 15, 133 Castlereagh Street, Sydney NSW 2000	Email for results : emily.smith@ghd.com; henry.luo@ghd.com; andrew.duval@ghd.com; esdat+ghd_aus@esdatalsync.net	PROJECT Name : M12 Water Sampling	Data output format: ESDAT

	Analytes						Some common holding times (with correct preservation). For further information contact the lab			
Special Directions & Comments :	metals	als					Waters		Soils	
							BTEX, MAH, VOC	14 days	BTEX, MAH, VOC	14 days
							TRH, PAH, Phenols, Pesticides	7 days	TRH, PAH, Phenols, Pesticides	14 days
Sent from ALS							Heavy Metals	6 months	Heavy Metals	6 months
							Mercury, CrVI	28 days	Mercury, CrVI	28 days
							Microbiological testing	24 hours	Microbiological testing	72 hours
							BOD, Nitrate, Nitrite, Total N	2 days	Anions	28 days
							Solids - TSS, TDS etc	7 days	SPOCAS, pH Field and FOX, CrS	24 hours
Eurofins 1 mol DI water batch number:										

[illegible]

	Laboratory Staff	Method Of Shipment	Temperature on arrival:
Relinquished By: Andrew Duval	Received By:	☐ Courier ☐ Hand Delivered ☐ Postal ☐ Courier Consignment # :	Report number:
Date & Time : 6/12/2023 - 5pm	Date & Time :		
Signature:	Signature:		



SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2342531**

Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HENRY LUO	Contact	: Sarah Mathew
Address	: LEVEL 15, 133 CASTLEREAGH STREET SYDNEY NSW, AUSTRALIA 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: henry.luo@ghd.com	E-mail	: sarah.mathew@alsglobal.com
Telephone	: +61 02 9239 7100	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 9239 7199	Facsimile	: +61-2-8784 8500
Project	: 12554717	Page	: 1 of 3
Order number	: 12554717	Quote number	: ES2021GHDSE0026 (SY/322/21)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: ANDREW DUVAL, EMILY SMITH		

Dates

Date Samples Received	: 06-Dec-2023 17:15	Issue Date	: 14-Dec-2023
Client Requested Due Date	: 14-Dec-2023	Scheduled Reporting Date	: 14-Dec-2023

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: 7	Temperature	: 10.6, 11.5, 10.8°C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 8 / 8

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- This is an updated SRN which indicates the change in sampling date for sample 05, GWDUP1
- **GWDUP2 has been forwarded to Eurofins.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EG020F Dissolved Metals by ICP/MS	WATER - NT-01D & 02 Major Cations & Anions (Ca, Mg, Na, K, Cl, SO ₄ ,)	WATER - NT-08A Total Nitrogen + NO ₂ + NO ₃ + NH ₃ + Total P +	WATER - W-02 8 Metals	WATER - W-04 TRH/BTEXN
ES2342531-001	06-Dec-2023 00:00	BH104R	✓	✓	✓	✓	✓	✓	✓
ES2342531-002	06-Dec-2023 00:00	BH107R	✓	✓	✓	✓	✓	✓	✓
ES2342531-003	06-Dec-2023 00:00	BH112R	✓	✓	✓	✓	✓	✓	✓
ES2342531-004	05-Dec-2023 00:00	BH145R	✓	✓	✓	✓	✓	✓	✓
ES2342531-005	05-Dec-2023 00:00	GWDUP1						✓	

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP080 BTEXN	WATER - W-02T 8 metals (Total)	WATER - W-18 TRH(C6 - C9)/BTEXN
ES2342531-006	06-Dec-2023 00:00	GWRB1		✓	
ES2342531-007	30-Nov-2023 00:00	Trip spike 12	✓		
ES2342531-008	30-Nov-2023 00:00	Trip blank			✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Accounts Payable Australia

- Email accountspayableAU@ghd.com

Email andrew.duval@ghd.com

- [illegible]

Email emily.smith@ghd.com

- [illegible]

Email esdat+ghd_au@esdatlabsync.net

- Email henry.luo@ghd.com

Email henry.luo@ghd.com

- [illegible]



CERTIFICATE OF ANALYSIS

Work Order : **ES2342531**
Client : **GHD PTY LTD**
Contact : **MR HENRY LUO**
Address : **LEVEL 15, 133 CASTLEREAGH STREET**
SYDNEY NSW, AUSTRALIA 2000
Telephone : **+61 02 9239 7100**
Project : **12554717**
Order number : **12554717**
C-O-C number : **----**
Sampler : **ANDREW DUVAL, EMILY SMITH**
Site : **----**
Quote number : **SY/322/21**
No. of samples received : **8**
No. of samples analysed : **8**

Page : 1 of 8
Laboratory : Environmental Division Sydney
Contact : Sarah Mathew
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 06-Dec-2023 17:15
Date Analysis Commenced : 07-Dec-2023
Issue Date : 14-Dec-2023 17:03



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
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW



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.

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene 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.
- EG035: Poor matrix spike recovery was obtained for Mercury on sample ES12342389 # 1. Confirmed by re-analysis.
- TDS by method EA-015 may bias high for sample 3 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- EP080: Sample TRIP SPIKE contains volatile compounds spiked into the sample containers prior to dispatch from the laboratory. BTEXN compounds spiked at 20 ug/L.
- 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.
- 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.



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time				06-Dec-2023 00:00	06-Dec-2023 00:00	06-Dec-2023 00:00	05-Dec-2023 00:00	05-Dec-2023 00:00
Compound	CAS Number	LOR	Unit	ES2342531-001	ES2342531-002	ES2342531-003	ES2342531-004	ES2342531-005
				Result	Result	Result	Result	Result
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	5060	2320	11400	11000	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	79	106	77	17	----
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	888	511	2270	2610	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	1020	1530	1340	998	----
Total Alkalinity as CaCO3	----	1	mg/L	1020	1530	1340	998	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	157	158	1290	383	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	2160	277	3930	5800	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	123	38	228	212	----
Magnesium	7439-95-4	1	mg/L	141	101	414	506	----
Sodium	7440-23-5	1	mg/L	1590	649	2970	3030	----
Potassium	7440-09-7	1	mg/L	19	14	46	19	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	0.002	<0.001	0.006	<0.001	0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.002
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	0.002	0.008	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	0.006	0.007	0.016	<0.005	<0.005



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time					06-Dec-2023 00:00	06-Dec-2023 00:00	06-Dec-2023 00:00	05-Dec-2023 00:00	05-Dec-2023 00:00
Compound	CAS Number	LOR	Unit		ES2342531-001	ES2342531-002	ES2342531-003	ES2342531-004	ES2342531-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Manganese	7439-96-5	0.001	mg/L		0.115	0.007	0.109	0.158	----
Iron	7439-89-6	0.05	mg/L		1.13	<0.05	<0.05	2.98	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		1.90	<0.01	2.23	2.14	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	0.07	<0.01	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	2.50	1.63	<0.01	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	2.50	1.70	<0.01	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		2.1	0.4	2.5	2.2	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
[^] Total Nitrogen as N	----	0.1	mg/L		2.1	2.9	4.2	2.2	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.10	0.06	0.19	0.04	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	0.12	<0.01	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		84.6	41.7	164	192	----
∅ Total Cations	----	0.01	meq/L		87.4	38.8	176	184	----
∅ Ionic Balance	----	0.01	%		1.63	3.57	3.33	1.87	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	----
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time					06-Dec-2023 00:00	06-Dec-2023 00:00	06-Dec-2023 00:00	05-Dec-2023 00:00	05-Dec-2023 00:00
Compound	CAS Number	LOR	Unit		ES2342531-001	ES2342531-002	ES2342531-003	ES2342531-004	ES2342531-005
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	----
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	----
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	----
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	----
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	----
^ Total Xylenes	----	2	µg/L		<2	<2	<2	<2	----
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	----
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	----
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%		100	101	103	97.8	----
Toluene-D8	2037-26-5	2	%		98.6	100	98.8	90.1	----
4-Bromofluorobenzene	460-00-4	2	%		116	117	117	110	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				GWRB1	Trip spike 12	Trip blank	----	----
Sampling date / time				06-Dec-2023 00:00	30-Nov-2023 00:00	30-Nov-2023 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2342531-006	ES2342531-007	ES2342531-008	-----	-----
				Result	Result	Result	----	----
EG020T: Total 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	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	----	----	<20	----	----
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	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	----	14	<1	----	----
Toluene	108-88-3	2	µg/L	----	15	<2	----	----
Ethylbenzene	100-41-4	2	µg/L	----	15	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	----	15	<2	----	----
ortho-Xylene	95-47-6	2	µg/L	----	17	<2	----	----
^ Total Xylenes	----	2	µg/L	----	32	<2	----	----
^ Sum of BTEX	----	1	µg/L	----	76	<1	----	----
Naphthalene	91-20-3	5	µg/L	----	17	<5	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	----	88.5	89.0	----	----
Toluene-D8	2037-26-5	2	%	----	79.2	80.4	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GWRB1	Trip spike 12	Trip blank	----	----
Sampling date / time					06-Dec-2023 00:00	30-Nov-2023 00:00	30-Nov-2023 00:00	----	----
Compound	CAS Number	LOR	Unit		ES2342531-006	ES2342531-007	ES2342531-008	-----	-----
					Result	Result	Result	----	----
EP080S: TPH(V)/BTEX Surrogates - Continued									
4-Bromofluorobenzene	460-00-4	2	%		----	98.1	99.6	----	----



Surrogate Control Limits

Sub-Matrix: **WATER**

		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	72	143
Toluene-D8	2037-26-5	75	131
4-Bromofluorobenzene	460-00-4	73	137



QUALITY CONTROL REPORT

Work Order : **ES2342531**

Page : 1 of 12

Client : **GHD PTY LTD**

Laboratory : Environmental Division Sydney

Contact : **MR HENRY LUO**

Contact : Sarah Mathew

Address : **LEVEL 15, 133 CASTLEREAGH STREET
SYDNEY NSW, AUSTRALIA 2000**

Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : +61 02 9239 7100

Telephone : +61-2-8784 8555

Project : 12554717

Date Samples Received : 06-Dec-2023

Order number : 12554717

Date Analysis Commenced : 07-Dec-2023

C-O-C number : ----

Issue Date : 14-Dec-2023

Sampler : **ANDREW DUVAL, EMILY SMITH**

Site : ----

Quote number : SY/322/21

No. of samples received : 8

No. of samples analysed : 8



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
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW



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: 5487058)									
ES2342200-013	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	356	335	5.9	0% - 20%
ES2342402-011	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	285	300	5.1	0% - 20%
ES2342437-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	382	394	3.1	0% - 20%
ES2342516-006	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	364	344	5.8	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 5487066)									
ES2342446-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	1010	980	3.0	0% - 20%
ES2342490-009	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	286	292	1.7	0% - 20%
ES2342491-005	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	2690	2660	0.9	0% - 20%
ES2342491-016	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	866	894	3.3	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 5487059)									
ES2342200-013	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	40	38	4.4	No Limit
ES2342402-011	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	8	6	34.5	No Limit
ES2342437-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	32	29	10.5	No Limit
ES2342516-006	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	12	9	23.8	No Limit
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 5487067)									
ES2342446-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	32	34	6.1	No Limit
ES2342490-009	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
ES2342491-005	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	14	13	0.0	No Limit
ES2342491-016	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	67	68	2.2	0% - 50%
ED037P: Alkalinity by PC Titrator (QC Lot: 5486924)									
ES2342362-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	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 (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 5486924) - continued									
ES2342362-001	Anonymous	ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	1230	1230	0.4	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	1230	1230	0.4	0% - 20%
ES2342364-022	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	512	517	1.1	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	512	517	1.1	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 5477311)									
ES2342408-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	37	37	0.0	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 5478859)									
ES2342343-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	59	58	0.0	0% - 20%
EW2305481-003	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	19	19	0.0	0% - 50%
ED045G: Chloride by Discrete Analyser (QC Lot: 5477314)									
ES2342408-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	259	256	1.3	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 5478858)									
ES2342343-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	104	110	6.2	0% - 20%
EW2305481-003	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	57	54	4.2	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 5477772)									
ES2342531-001	BH104R	ED093F: Calcium	7440-70-2	1	mg/L	123	113	9.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	141	130	8.2	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	1590	1460	8.5	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	19	17	9.3	0% - 50%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5477771)									
EW2305421-005	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	0.002	0.002	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.075	0.069	9.4	0% - 20%
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.048	0.045	7.4	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.177	0.168	5.2	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.079	0.077	2.7	0% - 50%
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.23	0.24	0.0	No Limit
ES2342531-001	BH104R	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	0.002	0.002	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: Manganese	7439-96-5	0.001	mg/L	0.115	0.104	10.1	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 (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5477771) - continued									
ES2342531-001	BH104R	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	0.006	0.006	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	1.13	1.13	0.0	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5485874)									
ES2342369-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0002	0.0002	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	0.003	0.003	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.020	0.020	0.0	0% - 20%
		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	0.087	0.087	0.0	0% - 50%
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.11	0.11	0.0	No Limit
ES2342545-001	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	0.002	0.002	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.060	0.060	0.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.002	0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.040	0.040	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.19	0.18	7.8	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 5485693)									
ES2342516-013	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.004	0.003	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.007	0.008	0.0	No Limit
EW2305471-004	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	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 (%)
EG035F: Dissolved Mercury by FIMS (QC Lot: 5477769)									
ES2342202-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2342208-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 5485875)									
ES2342403-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2342446-010	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5489774)									
ES2342435-021	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2342516-010	Anonymous	EG035T: 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: 5485366)									
ES2342516-011	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.16	0.15	0.0	0% - 50%
ES2342868-003	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.04	0.04	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 5477313)									
ES2342531-004	BH145R	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2342408-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 5478857)									
ES2342516-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2342343-001	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: 5485365)									
ES2342516-011	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.04	0.04	0.0	No Limit
ES2342868-003	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 5485369)									
ES2342516-011	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.2	1.2	0.0	0% - 50%
ES2342868-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	2.3	2.2	5.9	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 5485370)									
ES2342516-011	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.06	0.06	0.0	No Limit
ES2342868-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.32	0.31	0.0	0% - 20%
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 5477312)									
ES2342408-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.09	0.14	42.8	0% - 50%
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 5478861)									
ES2342516-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EW2305481-003	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5478161)									
ES2342341-005	Anonymous	EP071: C15 - C28 Fraction	----	100	µg/L	600	<100	143	No Limit
		EP071: C10 - C14 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
		EP071: C29 - C36 Fraction	----	50	µg/L	470	<50	161	No Limit
ES2342341-001	Anonymous	EP071: C15 - C28 Fraction	----	100	µg/L	<100	<100	0.0	No Limit

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 Work Order : ES2342531
 Client : GHD PTY LTD
 Project : 12554717



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 Petroleum Hydrocarbons (QC Lot: 5478161) - continued									
ES2342341-001	Anonymous	EP071: C10 - C14 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
		EP071: C29 - C36 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5483676)									
ES2342470-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES2342531-004	BH145R	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5478161)									
ES2342341-005	Anonymous	EP071: >C10 - C16 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C16 - C34 Fraction	----	100	µg/L	950	<100	162	No Limit
		EP071: >C34 - C40 Fraction	----	100	µg/L	250	<100	86.1	No Limit
ES2342341-001	Anonymous	EP071: >C10 - C16 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C16 - C34 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5483676)									
ES2342470-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
ES2342531-004	BH145R	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 5483676)									
ES2342470-001	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	108-38-3 106-42-3	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
ES2342531-004	BH145R	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	108-38-3 106-42-3	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

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 Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 5487058)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	96.5	87.0	109
				<10	293 mg/L	102	75.2	126
				<10	2470 mg/L	97.9	83.0	124
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 5487066)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	99.4	87.0	109
				<10	293 mg/L	102	75.2	126
				<10	2470 mg/L	99.2	83.0	124
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 5487059)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	100	83.0	129
				<5	1000 mg/L	95.8	82.0	110
				<5	841 mg/L	103	83.0	118
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 5487067)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	103	83.0	129
				<5	1000 mg/L	99.4	82.0	110
				<5	841 mg/L	110	83.0	118
ED037P: Alkalinity by PC Titrator (QCLot: 5486924)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	97.2	81.0	115
				----	50 mg/L	102	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 5477311)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	104	82.0	122
				<1	500 mg/L	111	82.0	122
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 5478859)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	101	82.0	122
				<1	500 mg/L	99.6	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 5477314)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	104	80.9	127
				<1	1000 mg/L	101	80.9	127
ED045G: Chloride by Discrete Analyser (QCLot: 5478858)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	102	80.9	127
				<1	1000 mg/L	95.3	80.9	127
ED093F: Dissolved Major Cations (QCLot: 5477772)								



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
ED093F: Dissolved Major Cations (QCLot: 5477772) - continued								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	100	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	94.6	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	95.1	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	102	85.0	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 5477771)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	93.0	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	91.2	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	91.5	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	89.4	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	89.0	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	92.7	82.0	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	91.0	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	90.9	81.0	117
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	93.5	82.0	112
EG020F: Dissolved Metals by ICP-MS (QCLot: 5485874)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	103	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	101	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	99.5	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	99.4	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	96.5	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	99.5	82.0	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	100	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	101	81.0	117
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	97.3	82.0	112
EG020T: Total Metals by ICP-MS (QCLot: 5485693)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	93.6	82.0	114
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	98.2	84.0	112
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	96.2	86.0	116
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	94.6	83.0	118
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	96.5	85.0	115
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	90.9	84.0	116
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	95.2	79.0	117
EG035F: Dissolved Mercury by FIMS (QCLot: 5477769)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	88.7	83.0	105

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
Method: Compound		CAS Number	LOR	Unit	Result	Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High
EG035F: Dissolved Mercury by FIMS (QCLot: 5485875)								
EG035F: Mercury		7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	95.1	83.0 105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5489774)								
EG035T: Mercury		7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	89.2	77.0 111
EK055G: Ammonia as N by Discrete Analyser (QCLot: 5485366)								
EK055G: Ammonia as N		7664-41-7	0.01	mg/L	<0.01	1 mg/L	108	90.0 114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5477313)								
EK057G: Nitrite as N		14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	98.3	82.0 114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5478857)								
EK057G: Nitrite as N		14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	96.8	82.0 114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5485365)								
EK059G: Nitrite + Nitrate as N		----	0.01	mg/L	<0.01	0.5 mg/L	107	91.0 113
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5485369)								
EK061G: Total Kjeldahl Nitrogen as N		----	0.1	mg/L	<0.1	10 mg/L	101	69.0 101
					<0.1	1 mg/L	99.5	70.0 118
					<0.1	5 mg/L	106	70.0 130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5485370)								
EK067G: Total Phosphorus as P		----	0.01	mg/L	<0.01	4.42 mg/L	97.1	71.3 126
					<0.01	0.442 mg/L	94.3	71.3 126
					<0.01	1 mg/L	104	70.0 130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 5477312)								
EK071G: Reactive Phosphorus as P		14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	101	85.0 117
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 5478861)								
EK071G: Reactive Phosphorus as P		14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	103	85.0 117
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5478161)								
EP071: C10 - C14 Fraction		----	50	µg/L	<50	400 µg/L	63.4	53.7 97.0
EP071: C15 - C28 Fraction		----	100	µg/L	<100	600 µg/L	81.5	63.3 107
EP071: C29 - C36 Fraction		----	50	µg/L	<50	400 µg/L	87.9	58.3 120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5483676)								
EP080: C6 - C9 Fraction		----	20	µg/L	<20	260 µg/L	93.9	75.0 127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5478161)								
EP071: >C10 - C16 Fraction		----	100	µg/L	<100	500 µg/L	69.7	53.9 95.5
EP071: >C16 - C34 Fraction		----	100	µg/L	<100	700 µg/L	73.9	57.8 110
EP071: >C34 - C40 Fraction		----	100	µg/L	<100	300 µg/L	70.9	50.5 115
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5483676)								

Matrix Spike (MS) Report

Sub-Matrix: WATER

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: 5477311)							
ES2342408-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	87.0	70.0	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 5478859)							
ES2342343-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 5477314)							
ES2342408-001	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	88.8	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 5478858)							
ES2342343-001	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	84.1	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 5477771)							
ES2342225-005	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	103	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	102	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	102	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	103	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	102	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	102	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	101	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	100	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 5485874)							

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 5485874) - continued							
ES2342369-002	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	101	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	98.5	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	99.9	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	106	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	98.7	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	100.0	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	101	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	100	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 5485693)							
ES2342516-014	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	95.4	70.0	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	102	70.0	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	99.1	70.0	130
		EG020A-T: Copper	7440-50-8	1 mg/L	99.5	70.0	130
		EG020A-T: Lead	7439-92-1	1 mg/L	102	70.0	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	94.9	70.0	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	98.2	70.0	130
		EG035F: Dissolved Mercury by FIMS (QCLot: 5477769)					
ES2342191-002	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	79.4	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 5485875)							
ES2342389-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	# 61.3	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5489774)							
ES2342516-001	Anonymous	EG035T: Mercury	7439-97-6	0.01 mg/L	90.6	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 5485366)							
ES2342516-011	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	118	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5477313)							
ES2342408-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	96.4	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5478857)							
ES2342343-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	99.9	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5485365)							
ES2342516-011	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	108	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5485369)							
ES2342516-012	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	100	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5485370)							
ES2342516-012	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	107	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 5477312)							



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 5477312) - continued							
ES2342408-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	97.8	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 5478861)							
ES2342516-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	102	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5478161)							
ES2342341-002	Anonymous	EP071: C10 - C14 Fraction	----	200 µg/L	106	70.0	130
		EP071: C15 - C28 Fraction	----	250 µg/L	126	71.0	130
		EP071: C29 - C36 Fraction	----	200 µg/L	98.1	67.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5483676)							
ES2342470-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	83.2	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5478161)							
ES2342341-002	Anonymous	EP071: >C10 - C16 Fraction	----	250 µg/L	93.5	70.0	130
		EP071: >C16 - C34 Fraction	----	350 µg/L	99.6	75.0	130
		EP071: >C34 - C40 Fraction	----	150 µg/L	94.2	67.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5483676)							
ES2342470-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	82.1	70.0	130
EP080: BTEXN (QCLot: 5483676)							
ES2342470-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	93.7	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	93.3	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	95.4	70.0	130
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	95.0	70.0	130
			106-42-3				
		EP080: ortho-Xylene	95-47-6	25 µg/L	96.3	70.0	130
	EP080: Naphthalene	91-20-3	25 µg/L	105	70.0	130	



QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES2342531	Page	: 1 of 10
Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HENRY LUO	Telephone	: +61-2-8784 8555
Project	: 12554717	Date Samples Received	: 06-Dec-2023
Site	: ----	Issue Date	: 14-Dec-2023
Sampler	: ANDREW DUVAL, EMILY SMITH	No. of samples received	: 8
Order number	: 12554717	No. of samples analysed	: 8

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

- **NO** Quality Control Sample Frequency Outliers exist.



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							
ED041G: Sulfate (Turbidimetric) as SO ₄ 2- by DA	ES2342343--001	Anonymous	Sulfate as SO ₄ - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EG035F: Dissolved Mercury by FIMS	ES2342389--001	Anonymous	Mercury	7439-97-6	61.3 %	70.0-130%	Recovery less than lower data quality objective

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	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		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) BH145R	05-Dec-2023	----	----	----	12-Dec-2023	12-Dec-2023	✓
Clear Plastic Bottle - Natural (EA015H) BH104R, BH112R	BH107R, 06-Dec-2023	----	----	----	12-Dec-2023	13-Dec-2023	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H) BH145R	05-Dec-2023	----	----	----	12-Dec-2023	12-Dec-2023	✓
Clear Plastic Bottle - Natural (EA025H) BH104R, BH112R	BH107R, 06-Dec-2023	----	----	----	12-Dec-2023	13-Dec-2023	✓
EA065: Total Hardness as CaCO3							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BH145R	05-Dec-2023	----	----	----	08-Dec-2023	02-Jan-2024	✓
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BH104R, BH112R	BH107R, 06-Dec-2023	----	----	----	08-Dec-2023	03-Jan-2024	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) BH145R	05-Dec-2023	----	----	----	12-Dec-2023	19-Dec-2023	✓
Clear Plastic Bottle - Natural (ED037-P) BH104R, BH112R	06-Dec-2023	----	----	----	12-Dec-2023	20-Dec-2023	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) BH145R	05-Dec-2023	----	----	----	07-Dec-2023	02-Jan-2024	✓
Clear Plastic Bottle - Natural (ED041G) BH104R, BH112R	06-Dec-2023	----	----	----	08-Dec-2023	03-Jan-2024	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) BH145R	05-Dec-2023	----	----	----	07-Dec-2023	02-Jan-2024	✓
Clear Plastic Bottle - Natural (ED045G) BH104R, BH112R	06-Dec-2023	----	----	----	08-Dec-2023	03-Jan-2024	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BH145R	05-Dec-2023	----	----	----	08-Dec-2023	02-Jan-2024	✓
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BH104R, BH112R	06-Dec-2023	----	----	----	08-Dec-2023	03-Jan-2024	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) BH145R	05-Dec-2023	----	----	----	08-Dec-2023	02-Jun-2024	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) GWDUP1	05-Dec-2023	----	----	----	12-Dec-2023	02-Jun-2024	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) BH104R, BH112R	06-Dec-2023	----	----	----	08-Dec-2023	03-Jun-2024	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T) GWRB1	06-Dec-2023	12-Dec-2023	03-Jun-2024	✓	12-Dec-2023	03-Jun-2024	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) BH145R	05-Dec-2023	----	----	----	11-Dec-2023	02-Jan-2024	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) GWDUP1	05-Dec-2023	----	----	----	13-Dec-2023	02-Jan-2024	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) BH104R, BH112R	06-Dec-2023	----	----	----	11-Dec-2023	03-Jan-2024	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG035T) GWRB1	06-Dec-2023	----	----	----	14-Dec-2023	03-Jan-2024	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G) BH145R	05-Dec-2023	----	----	----	12-Dec-2023	02-Jan-2024	✓
Clear Plastic Bottle - Sulfuric Acid (EK055G) BH104R, BH112R	BH107R, 06-Dec-2023	----	----	----	12-Dec-2023	03-Jan-2024	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G) BH145R	05-Dec-2023	----	----	----	07-Dec-2023	07-Dec-2023	✓
Clear Plastic Bottle - Natural (EK057G) BH104R, BH112R	BH107R, 06-Dec-2023	----	----	----	08-Dec-2023	08-Dec-2023	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G) BH145R	05-Dec-2023	----	----	----	12-Dec-2023	02-Jan-2024	✓
Clear Plastic Bottle - Sulfuric Acid (EK059G) BH104R, BH112R	BH107R, 06-Dec-2023	----	----	----	12-Dec-2023	03-Jan-2024	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G) BH145R	05-Dec-2023	12-Dec-2023	02-Jan-2024	✓	12-Dec-2023	02-Jan-2024	✓
Clear Plastic Bottle - Sulfuric Acid (EK061G) BH104R, BH112R	BH107R, 06-Dec-2023	12-Dec-2023	03-Jan-2024	✓	12-Dec-2023	03-Jan-2024	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G) BH145R	05-Dec-2023	12-Dec-2023	02-Jan-2024	✓	12-Dec-2023	02-Jan-2024	✓
Clear Plastic Bottle - Sulfuric Acid (EK067G) BH104R, BH112R	BH107R, 06-Dec-2023	12-Dec-2023	03-Jan-2024	✓	12-Dec-2023	03-Jan-2024	✓
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural (EK071G) BH145R	05-Dec-2023	----	----	----	07-Dec-2023	07-Dec-2023	✓
Clear Plastic Bottle - Natural (EK071G) BH104R, BH112R	BH107R, 06-Dec-2023	----	----	----	08-Dec-2023	08-Dec-2023	✓

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 Work Order : ES2342531
 Client : GHD PTY LTD
 Project : 12554717



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) BH145R	05-Dec-2023	08-Dec-2023	12-Dec-2023	✓	12-Dec-2023	17-Jan-2024	✓
Amber Glass Bottle - Unpreserved (EP071) BH104R, BH112R	BH107R, 06-Dec-2023	08-Dec-2023	13-Dec-2023	✓	12-Dec-2023	17-Jan-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH145R	05-Dec-2023	13-Dec-2023	19-Dec-2023	✓	14-Dec-2023	19-Dec-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH104R, BH112R	BH107R, 06-Dec-2023	13-Dec-2023	20-Dec-2023	✓	14-Dec-2023	20-Dec-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) Trip blank	30-Nov-2023	13-Dec-2023	14-Dec-2023	✓	14-Dec-2023	14-Dec-2023	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071) BH145R	05-Dec-2023	08-Dec-2023	12-Dec-2023	✓	12-Dec-2023	17-Jan-2024	✓
Amber Glass Bottle - Unpreserved (EP071) BH104R, BH112R	BH107R, 06-Dec-2023	08-Dec-2023	13-Dec-2023	✓	12-Dec-2023	17-Jan-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH145R	05-Dec-2023	13-Dec-2023	19-Dec-2023	✓	14-Dec-2023	19-Dec-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH104R, BH112R	BH107R, 06-Dec-2023	13-Dec-2023	20-Dec-2023	✓	14-Dec-2023	20-Dec-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) Trip blank	30-Nov-2023	13-Dec-2023	14-Dec-2023	✓	14-Dec-2023	14-Dec-2023	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) BH145R	05-Dec-2023	13-Dec-2023	19-Dec-2023	✓	14-Dec-2023	19-Dec-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH104R, BH112R	BH107R, 06-Dec-2023	13-Dec-2023	20-Dec-2023	✓	14-Dec-2023	20-Dec-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) Trip spike - 12,	Trip blank 30-Nov-2023	13-Dec-2023	14-Dec-2023	✓	14-Dec-2023	14-Dec-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	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	3	21	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	39	10.26	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	4	30	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	3	19	15.79	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	3	21	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	8	80	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	8	80	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	11	18.18	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	20	10.00	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	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	21	19.05	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	39	5.13	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	30	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	19	10.53	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	21	19.05	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	10	80	12.50	12.50	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	10	80	12.50	12.50	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	20	15.00	15.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	11	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	20	15.00	15.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	5.00	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	
Laboratory Control Samples (LCS) - Continued							
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	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	21	9.52	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	39	5.13	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	30	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	19	10.53	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	21	9.52	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	80	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	80	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	11	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	21	9.52	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	39	5.13	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	30	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	19	10.53	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	21	9.52	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	11	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	5.00	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)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. 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 thiocyanate forms highly-coloured ferric thiocyanate 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 0.45um 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.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. 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 0.45um 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).



Analytical Methods	Method	Matrix	Method Descriptions
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ 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-NH ₃ 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-NO ₂ - 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-NO ₃ - F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined separately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NO _x) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO ₃ - F. Combined oxidised Nitrogen (NO ₂ +NO ₃) 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-NO ₃ -. 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)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with orthophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO ₄ 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)
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)

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)

Page : 10 of 10
Work Order : ES2342531
Client : GHD PTY LTD
Project : 12554717



Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. 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.

Subcon: Forward Lab Split WO
Lab / Analysis: Eurofin - GWDUP 2
Organised By / Date:
Relinquished By / Date:
Connote / Courier:

HT



CHAIN OF CUSTODY
ALS Laboratory
please tick →

WO No: _____
Attached By PO / Internal Sheet: _____

CLIENT: GHD Pty Ltd	TURNAROUND REQUIREMENT: ☐ Standard TAT (List due date): (Standard TAT may be longer for some tests e.g. Ultra Trace)	STANDARD TAT	FOR LABORATORY USE ONLY (Circle)			
OFFICE: Sydney	☐ Non Standard or urgent TAT (List due date):		Custody Seal intact?	Yes	No	N/A
PROJECT: M12 Groundwater	ALS QUOTE NO.: SY1322/21	COC SEQUENCE NUMBER (Circle)	Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
ORDER NUMBER: 12554717		COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt:	°C		
PROJECT MANAGER: Henry Luo	CONTACT PH: Henry Luo 0414 090 002	OF: 1 2 3 4 5 6 7	Other comment:			
SAMPLER: Emily Smith, Andrew Duval	SAMPLER MOBILE: 0431 522 928	RELINQUISHED BY: Andrew Duval - GHD	RECEIVED BY: <i>ARW</i>	RELINQUISHED BY:	RECEIVED BY:	
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): ESDAT	DATE/TIME: 19-01-2024	DATE/TIME: 19/1/24 1718	DATE/TIME:	DATE/TIME:	
Email Reports to: emily.smith@ghd.com; andrew.duval@ghd.com; henry.luo@ghd.com, ghdlabreports@ghd.com						

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: PLEASE DO NOT LOG ALL SAMPLES RECEIVED IN ONE WORKORDER. LOG AS TWO SEPARATE WORKORDERS AS PER THE TWO COCs PROVIDED.

ALS USE	SAMPLE DETAILS	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required)															
	MATRIX: SOLID (S) WATER (W)																		
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	Comments	TOTAL CONTAINERS	W-02 (dissolved 8 metals)	EG020F (dissolved Fe, Mn)	W-24 (TRH / BTEXW / PAH / Phenols / 8 metals dissolved)	NT-08A (TN, NO2, NO3, NH3, TP, soluble Reactive P)	NT-01D & 02 (major cations & anions; Hardness)	EA016H (TDS)	EA023H (TSS)	EP075A (SIM) (Phenols - Standard level (15 analytes))	W-02T (8 total metals)	BTEXW				
1	BH104R	19/01/2024	Water		6		X	X	X	X	X	X							
2	BH107R	19/01/2024	Water		6		X	X	X	X	X	X							
3	BH112R	19/01/2024	Water		6		X	X	X	X	X	X							
4	BH145R	18/01/2024	Water		6		X	X	X	X	X	X							
5	GWDUP1	18/01/2024	Water		1	X													
6	GWDUP2	19/01/2024	Water	PLEASE FORWARD TO EUROFIN WITH ATTACHED COC	1														
7	GWRB1	19/01/2024	Water		1										X				
8	Trip spike	15/01/2024	Water		1											X			
9	Trip blank	15/01/2024	Water		1											X			

Environmental Division
Sydney
Work Order Reference
ES2401985



Telephone : +61-2-8784 8655



mgt

☒ **Sydney**Unit F3 - 6 Building F, 16 Mars Road, Lane Cove
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Email: enviro.syd@mgtlabmark.com.au☐ **Brisbane**Unit 1-21 Smallwood Place, Murrarie
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Phone: +613 8564 5000 Fax: +613 8564 5000
Email: enquires.melb@mgtlabmark.com.au**CHAIN OF CUSTODY RECORD****CLIENT DETAILS**Page 1 of 1

Company Name : GHD Pty Ltd, Sydney	Contact Name : Emily Smith 0431 522 328	Purchase Order : 12554717	COC Number :
Office Address :	Project Manager: Henry Luo 0414 050 002	PROJECT Number : 12554717	Eurofins mgt quote ID :
Level 15, 133 Castlereagh Street, Sydney NSW 2000	Email for results : emily.smith@ghd.com; andrew.duval@ghd.com; henry.luo@ghd.com; ghdlabreports@ghd.com	PROJECT Name : M12 Water Sampling	Data output format: BSDAT

Special Directions & Comments :	Analytes						Some common holding times (with correct preservation). For further information contact the lab			
	Dissolved metals		Total metals		Waters		Soils			
Sent from ALS					BTEX, MAH, VOC	14 days	BTEX, MAH, VOC	14 days		
					TRH, PAH, Phenols, Pesticides	7 days	TRH, PAH, Phenols, Pesticides	14 days		
					Heavy Metals	6 months	Heavy Metals	6 months		
					Mercury, CrVI	28 days	Mercury, CrVI	28 days		
					Microbiological testing	24 hours	Microbiological testing	72 hours		
					BOD, Nitrate, Nitrite, Total N	2 days	Anions	28 days		
Eurofins mgt DI water batch number:					Solids - TSS, TDS etc	7 days	SPOCAS, pH Field and FOX, CrS	24 hours		
					Ferrous iron	7 days	ASLP, TCLP	7 days		

	Sample ID	Date	Matrix	Dissolved metals	Total metals	Containers:								Sample comments:
						500P	250P	80P	1LA	40mL vial	200mL A	Jar	Bag	
1	SWDUP2	19/01/2024	Water		X			1						
2	GWDUP2	19/01/2024	Water	X				1						
3														
4														
5														
6														
7														
8														
9														
10														

		Laboratory Staff		Method Of Shipment		Temperature on arrival:
Relinquished By: Andrew Duval – GHD		Received By:		☐ Courier ☐ Hand Delivered ☐ Postal Courier Consignment # :		Report number:
Date & Time : 19-01-2024		Date & Time :				
Signature: Duval		Signature:				



SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2401985**

Amendment : **1**

Client : **GHD PTY LTD**
Contact : **MR HENRY LUO**
Address : **LEVEL 15, 133 CASTLEREAGH STREET
SYDNEY NSW, AUSTRALIA 2000**

Laboratory : **Environmental Division Sydney**
Contact : **Samiksha Sathish**
Address : **277-289 Woodpark Road Smithfield
NSW Australia 2164**

E-mail : **henry.luo@ghd.com**
Telephone : **+61 02 9239 7100**
Facsimile : **+61 02 9239 7199**

E-mail : **samiksha.sathish@alsglobal.com**
Telephone : **+61-2-8784 8555**
Facsimile : **+61-2-8784 8500**

Project : **12554717**
Order number : **12554717**
C-O-C number : **----**
Site : **----**
Sampler : **ANDREW DUVAL, EMILY SMITH**

Page : **1 of 3**
Quote number : **ES2021GHDSE0026 (SY/322/21)**
QC Level : **NEPM 2013 B3 & ALS QC Standard**

Dates

Date Samples Received : **19-Jan-2024 17:18**
Client Requested Due Date : **29-Jan-2024**

Issue Date : **31-Jan-2024**
Scheduled Reporting Date : **29-Jan-2024**

Delivery Details

Mode of Delivery : **Client Drop Off**
No. of coolers/boxes : **7**

Security Seal : **Not Available**
Temperature : **9.2, 11.0, 11.8°C - Ice present**

Receipt Detail :
No. of samples received / analysed : **8 / 8**

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **Sample GWDUP2 has been forwarded to Eurofins.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months $\pm$ 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EG020F Dissolved Metals by ICP/MS	WATER - NT-01D & 02 Major Cations & Anions (Ca, Mg, Na, K, Cl, SO ₄ ,)	WATER - NT-08 Total Nitrogen + NO ₂ + NO ₃ + NH ₃ + Total P	WATER - W-02 8 Metals	WATER - W-24 TRH/BTEXN/PAH/Phenols
ES2401985-001	19-Jan-2024 00:00	BH104R	✓	✓	✓	✓	✓	✓	✓
ES2401985-002	19-Jan-2024 00:00	BH107R	✓	✓	✓	✓	✓	✓	✓
ES2401985-003	19-Jan-2024 00:00	BH112R	✓	✓	✓	✓	✓	✓	✓
ES2401985-004	19-Jan-2024 00:00	BH145R	✓	✓	✓	✓	✓	✓	✓
ES2401985-005	19-Jan-2024 00:00	GWDUP1						✓	

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP080 BTEXN	WATER - W-02T 8 metals (Total)	WATER - W-18 TRH(C6 - C9)/BTEXN
ES2401985-006	19-Jan-2024 00:00	GWRB1		✓	
ES2401985-007	15-Jan-2024 00:00	Trip Spike 3	✓		
ES2401985-008	15-Jan-2024 00:00	Trip Blank			✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Accounts Payable Australia

Email accountspayableAU@ghd.com

Email andrew.duval@ghd.com

- [illegible]

Email emily.smith@ghd.com

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Email henry.luo@ghd.com

- [illegible]



CERTIFICATE OF ANALYSIS

Work Order : **ES2401985**

Page : 1 of 10

Amendment : **1**

Client : **GHD PTY LTD**

Laboratory : Environmental Division Sydney

Contact : **MR HENRY LUO**

Contact : Samiksha Sathish

Address : LEVEL 15, 133 CASTLEREAGH STREET
SYDNEY NSW, AUSTRALIA 2000

Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : +61 02 9239 7100

Telephone : +61-2-8784 8555

Project : 12554717

Date Samples Received : 19-Jan-2024 17:18

Order number : 12554717

Date Analysis Commenced : 20-Jan-2024

C-O-C number : ----

Issue Date : 01-Feb-2024 13:18

Sampler : ANDREW DUVAL, EMILY SMITH

Site : ----

Quote number : SY/322/21

No. of samples received : 8

No. of samples analysed : 8



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
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Rassem Ayoubi	Senior Organic Chemist	Sydney Organics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW



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), Dibenzo(a,h)anthracene (1.0), Benzo(g,h,i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.
- 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.
- EG020A-T: Positive results for sample ES2401985-006 have been confirmed by re-digestion and re-analysis.
- EP080: Sample TRIP SPIKE contains volatile compounds spiked into the sample containers prior to dispatch from the laboratory. BTEXN compounds spiked at 20 ug/L.
- Amendment (31/01/2024): This report has been amended to switch on W-02 (8 Metals) for samples 01-04, as per client request.
- 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.
- 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.



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time				19-Jan-2024 00:00	19-Jan-2024 00:00	19-Jan-2024 00:00	19-Jan-2024 00:00	19-Jan-2024 00:00
Compound	CAS Number	LOR	Unit	ES2401985-001	ES2401985-002	ES2401985-003	ES2401985-004	ES2401985-005
				Result	Result	Result	Result	Result
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	5060	2550	10700	13300	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	82	108	60	99	----
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	936	535	2460	2890	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	993	1490	1260	980	----
Total Alkalinity as CaCO3	----	1	mg/L	993	1490	1260	980	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	196	203	1620	375	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	2080	328	4040	5810	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	131	41	251	227	----
Magnesium	7439-95-4	1	mg/L	148	105	446	564	----
Sodium	7440-23-5	1	mg/L	1650	795	3140	3280	----
Potassium	7440-09-7	1	mg/L	17	14	42	18	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	0.003	<0.001	0.006	0.002	0.002
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	0.002	0.004	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	0.001	0.007	0.001	0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	0.006	0.013	<0.005	<0.005



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time					19-Jan-2024 00:00	19-Jan-2024 00:00	19-Jan-2024 00:00	19-Jan-2024 00:00	19-Jan-2024 00:00
Compound	CAS Number	LOR	Unit		ES2401985-001	ES2401985-002	ES2401985-003	ES2401985-004	ES2401985-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Manganese	7439-96-5	0.001	mg/L		0.126	0.025	0.098	0.150	----
Iron	7439-89-6	0.05	mg/L		1.40	<0.05	<0.05	3.65	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		1.69	0.04	2.26	2.09	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	0.12	<0.01	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	2.13	0.94	<0.01	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	2.13	1.06	<0.01	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		1.8	0.3	2.4	2.3	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
[^] Total Nitrogen as N	----	0.1	mg/L		1.8	2.4	3.5	2.3	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.12	0.08	0.18	0.11	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		82.6	43.2	173	191	----
∅ Total Cations	----	0.01	meq/L		90.9	45.6	187	201	----
∅ Ionic Balance	----	0.01	%		4.80	2.67	3.90	2.45	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
2-Chlorophenol	95-57-8	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
2-Methylphenol	95-48-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
3- & 4-Methylphenol	1319-77-3	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	----
2-Nitrophenol	88-75-5	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time				19-Jan-2024 00:00	19-Jan-2024 00:00	19-Jan-2024 00:00	19-Jan-2024 00:00	19-Jan-2024 00:00	
Compound	CAS Number	LOR	Unit	ES2401985-001	ES2401985-002	ES2401985-003	ES2401985-004	ES2401985-005	
				Result	Result	Result	Result	Result	
EP075(SIM)A: Phenolic Compounds - Continued									
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
4-Chloro-3-methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Pentachlorophenol	87-86-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	----	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Pyrene	129-00-0	1.0	µg/L	<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	----	
Chrysene	218-01-9	1.0	µg/L	<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	----	
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<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	----	
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<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	----	
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<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	----	
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----	
EP080/071: Total Petroleum Hydrocarbons									



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time					19-Jan-2024 00:00	19-Jan-2024 00:00	19-Jan-2024 00:00	19-Jan-2024 00:00	19-Jan-2024 00:00
Compound	CAS Number	LOR	Unit		ES2401985-001	ES2401985-002	ES2401985-003	ES2401985-004	ES2401985-005
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
C6 - C9 Fraction	-----	20	µg/L		<20	<20	<20	<20	----
C10 - C14 Fraction	-----	50	µg/L		<50	<50	<50	<50	----
C15 - C28 Fraction	-----	100	µg/L		<100	<100	<100	<100	----
C29 - C36 Fraction	-----	50	µg/L		<50	<50	<50	<50	----
^ C10 - C36 Fraction (sum)	-----	50	µg/L		<50	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	----
>C10 - C16 Fraction	-----	100	µg/L		<100	<100	<100	<100	----
>C16 - C34 Fraction	-----	100	µg/L		<100	<100	<100	<100	----
>C34 - C40 Fraction	-----	100	µg/L		<100	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	-----	100	µg/L		<100	<100	<100	<100	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	-----	100	µg/L		<100	<100	<100	<100	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	----
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	----
^ Total Xylenes	-----	2	µg/L		<2	<2	<2	<2	----
^ Sum of BTEX	-----	1	µg/L		<1	<1	<1	<1	----
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1.0	%		23.6	23.8	28.8	33.0	----
2-Chlorophenol-D4	93951-73-6	1.0	%		46.5	46.5	56.8	60.8	----
2,4,6-Tribromophenol	118-79-6	1.0	%		35.7	34.0	48.9	51.3	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time					19-Jan-2024 00:00	19-Jan-2024 00:00	19-Jan-2024 00:00	19-Jan-2024 00:00	19-Jan-2024 00:00
Compound	CAS Number	LOR	Unit		ES2401985-001	ES2401985-002	ES2401985-003	ES2401985-004	ES2401985-005
					Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1.0	%		58.0	58.4	66.8	70.6	----
Anthracene-d10	1719-06-8	1.0	%		60.0	60.5	70.8	75.5	----
4-Terphenyl-d14	1718-51-0	1.0	%		61.2	64.5	74.2	75.9	----
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%		104	114	114	124	----
Toluene-D8	2037-26-5	2	%		96.1	103	108	93.8	----
4-Bromofluorobenzene	460-00-4	2	%		106	108	118	92.8	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				GWRB1	Trip Spike 3	Trip Blank	----	----
Sampling date / time				19-Jan-2024 00:00	15-Jan-2024 00:00	15-Jan-2024 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2401985-006	ES2401985-007	ES2401985-008	-----	-----
				Result	Result	Result	----	----
EG020T: Total 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	0.003	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	----	----	<20	----	----
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	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	----	17	<1	----	----
Toluene	108-88-3	2	µg/L	----	17	<2	----	----
Ethylbenzene	100-41-4	2	µg/L	----	17	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	----	18	<2	----	----
ortho-Xylene	95-47-6	2	µg/L	----	19	<2	----	----
[^] Total Xylenes	----	2	µg/L	----	37	<2	----	----
[^] Sum of BTEX	----	1	µg/L	----	88	<1	----	----
Naphthalene	91-20-3	5	µg/L	----	19	<5	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	----	115	110	----	----
Toluene-D8	2037-26-5	2	%	----	107	99.9	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GWRB1	Trip Spike 3	Trip Blank	----	----
Sampling date / time					19-Jan-2024 00:00	15-Jan-2024 00:00	15-Jan-2024 00:00	----	----
Compound	CAS Number	LOR	Unit		ES2401985-006	ES2401985-007	ES2401985-008	-----	-----
					Result	Result	Result	----	----
EP080S: TPH(V)/BTEX Surrogates - Continued									
4-Bromofluorobenzene	460-00-4	2	%		----	112	111	----	----



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	44
2-Chlorophenol-D4	93951-73-6	14	94
2,4,6-Tribromophenol	118-79-6	17	125
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	72	143
Toluene-D8	2037-26-5	75	131
4-Bromofluorobenzene	460-00-4	73	137



QUALITY CONTROL REPORT

Work Order : **ES2401985**

Page : 1 of 12

Amendment : **1**

Client : **GHD PTY LTD**

Contact : **MR HENRY LUO**

Address : **LEVEL 15, 133 CASTLEREAGH STREET
SYDNEY NSW, AUSTRALIA 2000**

Telephone : **+61 02 9239 7100**

Project : **12554717**

Order number : **12554717**

C-O-C number : **----**

Sampler : **ANDREW DUVAL, EMILY SMITH**

Site : **----**

Quote number : **SY/322/21**

No. of samples received : **8**

No. of samples analysed : **8**

Laboratory : **Environmental Division Sydney**

Contact : **Samiksha Sathish**

Address : **277-289 Woodpark Road Smithfield NSW Australia 2164**

Telephone : **+61-2-8784 8555**

Date Samples Received : **19-Jan-2024**

Date Analysis Commenced : **20-Jan-2024**

Issue Date : **01-Feb-2024**



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
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Rassem Ayoubi	Senior Organic Chemist	Sydney Organics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW



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**

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: 5556490)									
ES2401377-002	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	58	59	3.0	No Limit
ES2401980-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	1120	1150	2.0	0% - 20%
ES2401980-011	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	262	278	6.1	0% - 20%
ES2401923-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	4850	4770	1.7	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 5556491)									
ES2401377-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
ES2401980-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	113	105	7.1	0% - 20%
ES2401980-011	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	34	36	5.0	No Limit
ES2401923-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	36	51	34.7	0% - 50%
ED037P: Alkalinity by PC Titrator (QC Lot: 5555273)									
ES2401920-011	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	96	97	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	96	97	0.0	0% - 20%
ES2401847-001	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	15	14	0.0	0% - 50%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	15	14	0.0	0% - 50%
ED037P: Alkalinity by PC Titrator (QC Lot: 5555274)									
ES2401985-004	BH145R	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	980	974	0.7	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 (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 5555274) - continued									
ES2401985-004	BH145R	ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	980	974	0.7	0% - 20%
ME2400127-001	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	38	38	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	38	38	0.0	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 5552541)									
ES2401786-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.0	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 5552540)									
ES2401786-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	10	10	0.0	0% - 50%
ED093F: Dissolved Major Cations (QC Lot: 5558325)									
ES2401962-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	14	14	0.0	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	5	5	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	27	26	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.0	No Limit
ES2401962-011	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	45	47	3.4	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	12	12	0.0	0% - 50%
		ED093F: Sodium	7440-23-5	1	mg/L	29	28	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	4	4	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5558326)									
ES2401985-001	BH104R	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	0.003	0.003	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: Manganese	7439-96-5	0.001	mg/L	0.126	0.129	2.5	0% - 20%
		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
		EG020A-F: Iron	7439-89-6	0.05	mg/L	1.40	1.45	3.3	0% - 20%
ES2402052-001	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: Manganese	7439-96-5	0.001	mg/L	0.046	0.046	0.0	0% - 20%
		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
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.08	0.07	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 (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5558365)									
ES2402158-007	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: Manganese	7439-96-5	0.001	mg/L	0.008	0.008	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	0.077	0.077	0.0	0% - 50%
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
ES2402082-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0015	0.0016	0.0	0% - 50%
		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	0.002	0.003	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.107	0.103	3.6	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.017	0.017	0.0	0% - 50%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.682	0.676	0.9	0% - 20%
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 5557506)									
ES2401851-003	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.004	0.004	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.004	0.004	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.007	0.008	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.004	0.004	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.016	0.017	0.0	No Limit
ES2401980-006	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.001	0.0	No Limit
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit		
EG035F: Dissolved Mercury by FIMS (QC Lot: 5558366)									
ES2402081-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 5572788)									
ES2401985-002	BH107R	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	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 (%)
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5552438)									
ES2401591-004	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ME2400111-003	Anonymous	EG035T: 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: 5559936)									
ES2401980-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.04	0.04	0.0	No Limit
ES2401980-010	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.04	0.04	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 5552543)									
ES2401980-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2401980-013	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.02	0.02	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 5559937)									
ES2401980-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.15	0.15	0.0	0% - 50%
ES2401980-010	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.23	0.22	0.0	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 5559941)									
ES2401980-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.3	1.3	0.0	0% - 50%
ES2401980-011	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.6	1.5	0.0	0% - 50%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 5559940)									
ES2401980-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.20	0.19	0.0	0% - 50%
ES2401980-011	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.11	0.12	0.0	0% - 50%
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5555043)									
ES2401905-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES2401905-002	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5555043)									
ES2401905-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
ES2401905-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 5555043)									
ES2401905-001	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	2	µg/L	<2	<2	0.0	No Limit
			106-42-3						
		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
ES2401905-002	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	2	µg/L	<2	<2	0.0	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	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: BTEXN (QC Lot: 5555043) - continued									
ES2401905-002	Anonymous	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**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 5556490)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	96.6	87.0	109
				<10	293 mg/L	100	75.2	126
				<10	2470 mg/L	91.9	83.0	124
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 5556491)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	106	83.0	129
				<5	1000 mg/L	99.9	82.0	110
				<5	841 mg/L	115	83.0	118
ED037P: Alkalinity by PC Titrator (QCLot: 5555273)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	93.2	81.0	115
				----	50 mg/L	98.8	80.0	120
ED037P: Alkalinity by PC Titrator (QCLot: 5555274)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	92.8	81.0	115
				----	50 mg/L	103	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 5552541)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	104	82.0	122
				<1	500 mg/L	103	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 5552540)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	107	80.9	127
				<1	1000 mg/L	98.7	80.9	127
ED093F: Dissolved Major Cations (QCLot: 5558325)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	102	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	109	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	107	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	104	85.0	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 5558326)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	96.9	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	100	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	100	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	95.4	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	96.6	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	99.3	82.0	110

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 5558326) - continued								
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	94.4	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	96.1	81.0	117
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	99.7	82.0	112
EG020F: Dissolved Metals by ICP-MS (QCLot: 5558365)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	97.3	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	96.4	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	96.1	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	93.1	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	96.3	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	96.4	82.0	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	92.8	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	95.4	81.0	117
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	102	82.0	112
EG020T: Total Metals by ICP-MS (QCLot: 5557506)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	109	82.0	114
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	103	84.0	112
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	101	86.0	116
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	103	83.0	118
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	103	85.0	115
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	102	84.0	116
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	102	79.0	117
EG035F: Dissolved Mercury by FIMS (QCLot: 5558366)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	85.7	83.0	105
EG035F: Dissolved Mercury by FIMS (QCLot: 5572788)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	92.0	83.0	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5552438)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	93.1	77.0	111
EK055G: Ammonia as N by Discrete Analyser (QCLot: 5559936)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	103	90.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5552543)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	100	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5559937)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	104	91.0	113
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5559941)								



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5559941) - continued								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	80.9	69.0	101
				<0.1	1 mg/L	93.0	70.0	118
				<0.1	5 mg/L	86.9	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5559940)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	89.1	71.3	126
				<0.01	0.442 mg/L	102	71.3	126
				<0.01	1 mg/L	104	70.0	130
EP075(SIM)A: Phenolic Compounds (QCLot: 5553887)								
EP075(SIM): Phenol	108-95-2	1	µg/L	<1.0	5 µg/L	35.6	24.5	61.9
EP075(SIM): 2-Chlorophenol	95-57-8	1	µg/L	<1.0	5 µg/L	67.3	52.0	90.0
EP075(SIM): 2-Methylphenol	95-48-7	1	µg/L	<1.0	5 µg/L	76.7	51.0	91.0
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2	µg/L	<2.0	10 µg/L	62.7	44.0	88.0
EP075(SIM): 2-Nitrophenol	88-75-5	1	µg/L	<1.0	5 µg/L	73.4	48.0	100
EP075(SIM): 2,4-Dimethylphenol	105-67-9	1	µg/L	<1.0	5 µg/L	74.6	49.0	99.0
EP075(SIM): 2,4-Dichlorophenol	120-83-2	1	µg/L	<1.0	5 µg/L	73.9	53.0	105
EP075(SIM): 2,6-Dichlorophenol	87-65-0	1	µg/L	<1.0	5 µg/L	68.2	57.0	105
EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	1	µg/L	<1.0	5 µg/L	71.6	53.0	99.0
EP075(SIM): 2,4,6-Trichlorophenol	88-06-2	1	µg/L	<1.0	5 µg/L	66.1	50.0	106
EP075(SIM): 2,4,5-Trichlorophenol	95-95-4	1	µg/L	<1.0	5 µg/L	70.1	51.0	105
EP075(SIM): Pentachlorophenol	87-86-5	2	µg/L	<2.0	10 µg/L	36.0	10.0	95.0
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5553887)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	71.7	50.0	94.0
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	70.6	63.6	114
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	72.4	62.2	113
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	70.3	63.9	115
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	75.4	62.6	116
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	76.3	64.3	116
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	75.8	63.6	118
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	75.6	63.1	118
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	70.0	64.1	117
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	76.7	62.5	116
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	1	µg/L	<1.0	5 µg/L	74.6	61.7	119
	205-82-3							
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	83.6	63.0	115
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	72.8	63.3	117



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
						LCS	Low	High
CAS Number	LOR	Unit	Result					
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5553887) - continued								
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	68.9	59.9	118
EP075(SIM): Dibenzo(a,h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	68.0	61.2	117
EP075(SIM): Benzo(g,h,i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	67.7	59.1	118
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5553888)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	85.4	53.7	97.0
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	84.8	63.3	107
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	83.5	58.3	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5555043)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	78.7	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5553888)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	66.0	53.9	95.5
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	76.3	57.8	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	72.8	50.5	115
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5555043)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	79.5	75.0	127
EP080: BTEXN (QCLot: 5555043)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	95.7	68.3	119
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	90.8	73.5	120
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	94.4	73.8	122
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	90.9	73.0	122
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	94.1	76.4	123
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	103	75.5	124

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				Matrix Spike (MS) Report		
				Spike Concentration	Spike Recovery(%)	Acceptable Limits (%)
Sample ID	Method: Compound	CAS Number			MS	Low High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 5552541)						
ES2401786-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	113	70.0 130
ED045G: Chloride by Discrete Analyser (QCLot: 5552540)						
ES2401786-001	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	83.5	70.0 130

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 5558326)							
ES2401985-002	BH107R	EG020A-F: Arsenic	7440-38-2	2 mg/L	91.6	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.2 mg/L	88.4	70.0	130
		EG020A-F: Chromium	7440-47-3	2 mg/L	89.6	70.0	130
		EG020A-F: Copper	7440-50-8	2 mg/L	87.5	70.0	130
		EG020A-F: Lead	7439-92-1	2 mg/L	87.7	70.0	130
		EG020A-F: Manganese	7439-96-5	2 mg/L	88.2	70.0	130
		EG020A-F: Nickel	7440-02-0	2 mg/L	88.6	70.0	130
		EG020A-F: Zinc	7440-66-6	10 mg/L	89.3	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 5558365)							
ES2402029-001	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	120	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.1 mg/L	119	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	119	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	119	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	123	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	120	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	119	70.0	130
		EG020A-F: Zinc	7440-66-6	5 mg/L	124	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 5557506)							
ES2401851-004	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	110	70.0	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	103	70.0	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	94.9	70.0	130
		EG020A-T: Copper	7440-50-8	1 mg/L	103	70.0	130
		EG020A-T: Lead	7439-92-1	1 mg/L	103	70.0	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	101	70.0	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	90.6	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 5558366)							
ES2401985-005	GWDUP1	EG035F: Mercury	7439-97-6	0.01 mg/L	82.5	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 5572788)							
ES2401985-001	BH104R	EG035F: Mercury	7439-97-6	0.01 mg/L	74.4	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5552438)							
ES2401591-005	Anonymous	EG035T: Mercury	7439-97-6	0.01 mg/L	70.1	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 5559936)							
ES2401980-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	97.5	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5552543)							
ES2401980-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	100	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5559937)							



Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5559937) - continued							
ES2401980-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	101	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5559941)							
ES2401980-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	76.4	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5559940)							
ES2401980-002	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	83.7	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5555043)							
ES2401905-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	77.0	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5555043)							
ES2401905-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	76.2	70.0	130
EP080: BTEXN (QCLot: 5555043)							
ES2401905-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	86.6	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	92.7	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	103	70.0	130
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	101	70.0	130
			106-42-3				
		EP080: ortho-Xylene	95-47-6	25 µg/L	102	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	103	70.0	130



QA/QC Compliance Assessment to assist with Quality Review

Work Order : ES2401985

Page : 1 of 9

Amendment : 1

Client : GHD PTY LTD

Laboratory : Environmental Division Sydney

Contact : MR HENRY LUO

Telephone : +61-2-8784 8555

Project : 12554717

Date Samples Received : 19-Jan-2024

Site : ----

Issue Date : 01-Feb-2024

Sampler : ANDREW DUVAL, EMILY SMITH

No. of samples received : 8

Order number : 12554717

No. of samples analysed : 8

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.
- NO Matrix Spike outliers occur.
- 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.

Matrix: WATER

Analysis Holding Time Compliance

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.

Evaluation: ✖ = Holding time breach : ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			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)		19-Jan-2024	----	----	----	23-Jan-2024	26-Jan-2024	✓
BH104R,	BH107R,							
BH112R,	BH145R							
EA025: Total Suspended Solids dried at 104 ± 2 °C								
Clear Plastic Bottle - Natural (EA025H)		19-Jan-2024	----	----	----	23-Jan-2024	26-Jan-2024	✓
BH104R,	BH107R,							
BH112R,	BH145R							
EA065: Total Hardness as CaCO3								
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)		19-Jan-2024	----	----	----	24-Jan-2024	16-Feb-2024	✓
BH104R,	BH107R,							
BH112R,	BH145R							
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)		19-Jan-2024	----	----	----	22-Jan-2024	02-Feb-2024	✓
BH104R,	BH107R,							
BH112R,	BH145R							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)		19-Jan-2024	----	----	----	20-Jan-2024	16-Feb-2024	✓
BH104R,	BH107R,							
BH112R,	BH145R							



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G) BH104R, BH112R, BH107R, BH145R	19-Jan-2024	----	----	----	20-Jan-2024	16-Feb-2024	✓	
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BH104R, BH112R, BH107R, BH145R	19-Jan-2024	----	----	----	24-Jan-2024	16-Feb-2024	✓	
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) BH104R, BH112R, GWDUP1, BH107R, BH145R	19-Jan-2024	----	----	----	24-Jan-2024	17-Jul-2024	✓	
EG020T: Total Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T) GWRB1	19-Jan-2024	23-Jan-2024	17-Jul-2024	✓	23-Jan-2024	17-Jul-2024	✓	
EG035F: Dissolved Mercury by FIMS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) BH104R, BH112R, BH107R, BH145R	19-Jan-2024	----	----	----	01-Feb-2024	16-Feb-2024	✓	
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) GWDUP1	19-Jan-2024	----	----	----	29-Jan-2024	16-Feb-2024	✓	
EG035T: Total Recoverable Mercury by FIMS								
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG035T) GWRB1	19-Jan-2024	----	----	----	22-Jan-2024	16-Feb-2024	✓	
EK055G: Ammonia as N by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK055G) BH104R, BH112R, BH107R, BH145R	19-Jan-2024	----	----	----	24-Jan-2024	16-Feb-2024	✓	
EK057G: Nitrite as N by Discrete Analyser								
Clear Plastic Bottle - Natural (EK057G) BH104R, BH112R, BH107R, BH145R	19-Jan-2024	----	----	----	20-Jan-2024	21-Jan-2024	✓	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK059G) BH104R, BH112R, BH107R, BH145R	19-Jan-2024	----	----	----	24-Jan-2024	16-Feb-2024	✓	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK061G) BH104R, BH112R, BH107R, BH145R	19-Jan-2024	24-Jan-2024	16-Feb-2024	✓	24-Jan-2024	16-Feb-2024	✓	



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G) BH104R, BH112R, BH107R, BH145R	19-Jan-2024	24-Jan-2024	16-Feb-2024	✓	24-Jan-2024	16-Feb-2024	✓
EP075(SIM)A: Phenolic Compounds							
Amber Glass Bottle - Unpreserved (EP075(SIM)) BH104R, BH112R, BH107R, BH145R	19-Jan-2024	23-Jan-2024	26-Jan-2024	✓	24-Jan-2024	03-Mar-2024	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM)) BH104R, BH112R, BH107R, BH145R	19-Jan-2024	23-Jan-2024	26-Jan-2024	✓	24-Jan-2024	03-Mar-2024	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) BH104R, BH107R	19-Jan-2024	23-Jan-2024	26-Jan-2024	✓	25-Jan-2024	03-Mar-2024	✓
Amber Glass Bottle - Unpreserved (EP071) BH112R, BH145R	19-Jan-2024	23-Jan-2024	26-Jan-2024	✓	29-Jan-2024	03-Mar-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) Trip Blank	15-Jan-2024	25-Jan-2024	29-Jan-2024	✓	25-Jan-2024	29-Jan-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH104R, BH112R, BH107R, BH145R	19-Jan-2024	25-Jan-2024	02-Feb-2024	✓	25-Jan-2024	02-Feb-2024	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071) BH104R, BH107R	19-Jan-2024	23-Jan-2024	26-Jan-2024	✓	25-Jan-2024	03-Mar-2024	✓
Amber Glass Bottle - Unpreserved (EP071) BH112R, BH145R	19-Jan-2024	23-Jan-2024	26-Jan-2024	✓	29-Jan-2024	03-Mar-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) Trip Blank	15-Jan-2024	25-Jan-2024	29-Jan-2024	✓	25-Jan-2024	29-Jan-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH104R, BH112R, BH107R, BH145R	19-Jan-2024	25-Jan-2024	02-Feb-2024	✓	25-Jan-2024	02-Feb-2024	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) Trip Spike - 3, Trip Blank	15-Jan-2024	25-Jan-2024	29-Jan-2024	✓	25-Jan-2024	29-Jan-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH104R, BH112R, BH107R, BH145R	19-Jan-2024	25-Jan-2024	02-Feb-2024	✓	25-Jan-2024	02-Feb-2024	✓



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	4	29	13.79	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	10	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	38	10.53	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	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	17	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	40	10.00	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	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	4	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	4	29	13.79	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	9	22.22	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	10	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	38	5.26	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	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	9	22.22	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	5	40	12.50	12.50	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	5	40	12.50	12.50	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	20	15.00	15.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	20	15.00	15.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	4	25.00	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	
Laboratory Control Samples (LCS) - Continued							
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	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	10	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	38	5.26	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	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	40	5.00	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	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	4	25.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	10	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	38	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	17	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	4	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)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. 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 thiocyanate forms highly-coloured ferric thiocyanate 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 0.45um 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.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. 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 0.45um 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).



Analytical Methods	Method	Matrix	Method Descriptions
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ 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-NH ₃ 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-NO ₂ - 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-NO ₃ - F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined separately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NO _x) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO ₃ - F. Combined oxidised Nitrogen (NO ₂ +NO ₃) 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-NO ₃ -. 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 SO ₄ 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)
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)



Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. 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.

Subcon / Forward Lab / Split WOLab / Analysis: Encl as GWPUR2

Organised By / Date:

Relinquished By / Date:

Connote / Courier:

WO No:

Attached by PO / Internal Sheet:

Updated

Environmental Division
Sydney

Work Order Reference

ES2404914



Telephone : + 61-2-8784 8555

ALS Environmental		CHAIN OF CUSTODY		ALS Laboratory please tick →													
CLIENT: GHD Pty Ltd	TURNAROUND REQUIREMENT ☐ Standard TAT (List due date):	STANDARD TAT		FOR LABORATORY USE													
OFFICE: Sydney	(Standard TAT may be longer for some tests e.g. Ultra Trace)	☐ Non Standard or urgent TAT (List due date):		Custody Seal Intact?													
PROJECT: M12 Groundwater	ALS QUOTE NO.: SY/322/24	COC SEQUENCE NUMBER (Circle)		Free ice / frozen ice bricks present upon receipt:													
ORDER NUMBER: 12554717		COC: 1 2 3 4 5 6 7		Random Sample Temperature on Receipt:													
PROJECT MANAGER: Henry Luo	CONTACT PH: Henry Luo 0414 090 002	OF: 1 2 3 4 5 6 7		Other comment:													
SAMPLER: Andrew Duval, Jackson Miller	SAMPLER MOBILE: 0468301344	RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:												
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): ESDAT	Jackson Miller	<i>For</i>														
Email Reports to: emily.smith@ghd.com; andrew.duval@ghd.com; henry.luo@ghd.com; ghdlabreports@ghd.com	DATE/TIME:	DATE/TIME:	15/04/24 10:20	DATE/TIME:	DATE/TIME:												
14/05/2024 3:15PM																	
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: PLEASE DO NOT LOG ALL SAMPLES RECEIVED IN ONE WORKORDER. LOG AS TWO SEPARATE WORKORDERS AS PER THE TWO COCs PROVIDED.																	
ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB, Suite Codes must be ticked to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).											
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	Comments	TOTAL CONTAINERS	W-02 (dissolved & metals)	EG020F (dissolved Fe, Mn)	W-04 (TRH/BTEX/N)	NT-08A (TN, NO2, NO3, NH3, TP, soluble Reactive P)	NT-01D & 02 (major cations & anions, Hardness)	EA015H (TDS)	EA025H (TSS)	EP075a (SiM) (Phenolics - Standard level) (15 analyses)	W-02T (6 total metals)	BTEX/N		
1	BH104R	13/02/2024	Water		6	X	X	X	X	X	X	X	X				
2	BH107R	13/02/2024	Water		6	X	X	X	X	X	X	X	X				
3	BH112R	13/02/2024	Water		6	X	X	X	X	X	X	X	X				
4	BH145R	14/02/2024	Water		6	X	X	X	X	X	X	X	X				
5	GWDUP1	13/02/2024	Water		1	X											
6	GWDUP2	13/02/2024	Water	PLEASE FORWARD TO EUROFIN WITH ATTACHED COC	1												
7	GWRB1	13/02/2024	Water		1									X			
8	Trip spike	5/02/2024	Water		1										X		
9	Trip blank	5/02/2024	Water		1										X		



mgt

☒ **Sydney**

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2 Kingston Town Close, Oakleigh, VIC 3166
Phone: +613 8564 5000 Fax: +613 8564 5090
Email: enquiries.melb@mgtlabmark.com.au

CHAIN OF CUSTODY RECORD**CLIENT DETAILS**Page 1 of 1

Company Name : GHD Pty Ltd, Sydney	Contact Name : Andrew Duval 0468 301 344	Purchase Order : 12554717	COC Number :
Office Address :	Project Manager: Henry Luo 0414 090 002	PROJECT Number : 12554717	Eurofins mgt quote ID :
Level 15, 133 Castlersagh Street, Sydney NSW 2000	Email for results : emily.smith@ghd.com; andrew.duval@ghd.com; henry.luo@ghd.com; ghdlabreports@ghd.com	PROJECT Name : M12 Water Sampling	Data output format: ESDAT

Special Directions & Comments : Eurofins met DI water batch number:	Analytes						Some common holding times (with correct preservation). For further information contact the lab			
	d metals	tals					Waters		Soils	
							BTEX, MAH, VOC	14 days	BTEX, MAH, VOC	14 days
							TRH, PAH, Phenols, Pesticides	7 days	TRH, PAH, Phenols, Pesticides	14 days
							Heavy Metals	6 months	Heavy Metals	6 months
							Mercury, CrVI	28 days	Mercury, CrVI	28 days
							Microbiological testing	24 hours	Microbiological testing	72 hours
							BOD, Nitrate, Nitrite, Total N	2 days	Anions	28 days
							Solids - TSS, TDS etc	7 days	SPOCAS, pH Field and FOX, CrS	24 hours
							Ferrous iron	7 days	ASLP, TCLP	7 days

Eurofins | mgt DI water batch number:

	Sample ID	Date	Matrix	Dissolved metals	Total metals	Containers:								Sample comments:
						500P	250P	80P	1LA	40mL vial	200mL A	Jar	Bag	
1	SWDUP2	14/02/2024	Water					1						
2	GWDUP2	13/02/2024	Water					1						
3														
4														
5														
6														
7														
8														
9														
10														

		Laboratory Staff		Method Of Shipment		Temperature on arrival:	
Relinquished By:  (ALS)		Received By:		☐ Courier ☐ Hand Delivered ☐ Postal Courier Consignment # :		Report number:	
Date & Time : 14/2/24 1707		Date & Time :					
Signature: 		Signature:					



CHAIN OF CUSTODY

ALS Laboratory:
please tick →

[illegible][illegible]

CLIENT: GHD Pty Ltd		TURNAROUND REQUIREMENT ☐ Standard TAT (List due date):		STANDARD TAT		FOR LABORATORY USE ONLY (Circle)	
OFFICE: Sydney		(Standard TAT may be longer for some tests e.g., Ultra Trace ☐ Non-Standard or urgent TAT (List due date):				Custody Seal Intact? Yes No N/A	
PROJECT: M12 Groundwater		ALS QUOTE NO.: SY/322/21		COC SEQUENCE NUMBER (Circle)		Free ice / frozen ice blocks present upon receipt? Yes No N/A	
ORDER NUMBER: 12554717				COC: 1 2 3 4 5 6 7		Random Sample Temperature on Receipt: °C	
PROJECT MANAGER: Henry Luo		CONTACT PH: Henry Luo 0414 090 002		OF: 1 2 3 4 5 6 7		Other comment:	
SAMPLER: Andrew Duval, Jackson Miller		SAMPLER MOBILE: 0468301344		RELINQUISHED BY:		RECEIVED BY:	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default): ESDAT		Jackson Miller			
Email Reports to: emily.smith@ghd.com; andrew.duval@ghd.com; henry.luo@ghd.com, ghdlabreports@ghd.com		DATE/TIME:		DATE/TIME:		DATE/TIME:	
		14/05/2024 3:15PM				14/2/24 1526	

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

PLEASE DO NOT LOG ALL SAMPLES RECEIVED IN ONE WORKORDER. LOG AS TWO SEPARATE WORKORDERS AS PER THE TWO COCs PROVIDED.

[illegible]



CERTIFICATE OF ANALYSIS

Work Order : **ES2404914**
Client : **GHD PTY LTD**
Contact : **MR HENRY LUO**
Address : **LEVEL 15, 133 CASTLEREAGH STREET**
SYDNEY NSW, AUSTRALIA 2000
Telephone : **+61 02 9239 7100**
Project : **M12 GROUNDWATER**
Order number : **12554717**
C-O-C number : **----**
Sampler : **ANDREW DUVAL, Jackson Miller**
Site : **----**
Quote number : **SY/322/21**
No. of samples received : **8**
No. of samples analysed : **8**

Page : 1 of 8
Laboratory : Environmental Division Sydney
Contact : Samiksha Sathish
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 14-Feb-2024 15:09
Date Analysis Commenced : 15-Feb-2024
Issue Date : 22-Feb-2024 12:09



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
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW



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.
- 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.
- EK059G, EK057G: NO_x and Nitrite on sample no.1 confirmed by re-analysis.
- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- EP080: Sample TRIP SPIKE contains volatile compounds spiked into the sample containers prior to dispatch from the laboratory. BTEXN compounds spiked at 20 ug/L.
- 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.
- 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.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time					13-Feb-2024 00:00	13-Feb-2024 00:00	13-Feb-2024 00:00	14-Feb-2024 00:00	13-Feb-2024 00:00
Compound	CAS Number	LOR	Unit		ES2404914-001	ES2404914-002	ES2404914-003	ES2404914-004	ES2404914-005
					Result	Result	Result	Result	Result
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		5450	3010	11100	14500	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		142	40	48	115	----
EA065: Total Hardness as CaCO3									
Total Hardness as CaCO3	----	1	mg/L		882	515	1930	2460	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		1050	1580	1340	1050	----
Total Alkalinity as CaCO3	----	1	mg/L		1050	1580	1340	1050	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		232	220	1700	385	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		2210	320	4050	5600	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		111	38	202	206	----
Magnesium	7439-95-4	1	mg/L		147	102	347	473	----
Sodium	7440-23-5	1	mg/L		1330	629	2480	2720	----
Potassium	7440-09-7	1	mg/L		17	15	42	19	----
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		0.002	<0.001	0.004	<0.001	0.004
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	0.001	0.006	<0.001	0.006
Nickel	7440-02-0	0.001	mg/L		0.001	0.001	0.007	0.001	0.007
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	0.010	0.014	<0.005	0.013



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time					13-Feb-2024 00:00	13-Feb-2024 00:00	13-Feb-2024 00:00	14-Feb-2024 00:00	13-Feb-2024 00:00
Compound	CAS Number	LOR	Unit		ES2404914-001	ES2404914-002	ES2404914-003	ES2404914-004	ES2404914-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Manganese	7439-96-5	0.001	mg/L		0.124	0.012	0.099	0.154	----
Iron	7439-89-6	0.05	mg/L		1.04	<0.05	<0.05	0.31	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		1.45	0.05	2.20	2.12	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.08	<0.01	0.16	<0.01	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	2.27	0.34	<0.01	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	2.27	0.50	<0.01	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		1.7	0.4	2.6	2.3	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
[^] Total Nitrogen as N	----	0.1	mg/L		1.7	2.7	3.1	2.3	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.14	0.05	0.14	0.08	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	0.09	<0.01	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		88.2	45.2	176	187	----
∅ Total Cations	----	0.01	meq/L		75.9	38.0	148	168	----
∅ Ionic Balance	----	0.01	%		7.45	8.58	8.90	5.34	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	----
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time					13-Feb-2024 00:00	13-Feb-2024 00:00	13-Feb-2024 00:00	14-Feb-2024 00:00	13-Feb-2024 00:00
Compound	CAS Number	LOR	Unit		ES2404914-001	ES2404914-002	ES2404914-003	ES2404914-004	ES2404914-005
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	----
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	----
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	----
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	----
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	----
^ Total Xylenes	----	2	µg/L		<2	<2	<2	<2	----
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	----
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	----
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%		73.8	88.2	120	85.0	----
Toluene-D8	2037-26-5	2	%		94.1	110	129	108	----
4-Bromofluorobenzene	460-00-4	2	%		110	130	121	123	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				GWRB1	Trip Spike 16	Trip Blank	----	----
Sampling date / time				13-Feb-2024 00:00	05-Feb-2024 00:00	05-Feb-2024 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2404914-006	ES2404914-007	ES2404914-008	-----	-----
				Result	Result	Result	----	----
EG020T: Total 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	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	----	----	<20	----	----
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	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	----	16	<1	----	----
Toluene	108-88-3	2	µg/L	----	17	<2	----	----
Ethylbenzene	100-41-4	2	µg/L	----	17	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	----	18	<2	----	----
ortho-Xylene	95-47-6	2	µg/L	----	19	<2	----	----
^ Total Xylenes	----	2	µg/L	----	37	<2	----	----
^ Sum of BTEX	----	1	µg/L	----	87	<1	----	----
Naphthalene	91-20-3	5	µg/L	----	18	<5	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	----	84.7	87.5	----	----
Toluene-D8	2037-26-5	2	%	----	107	115	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GWRB1	Trip Spike 16	Trip Blank	----	----
Sampling date / time					13-Feb-2024 00:00	05-Feb-2024 00:00	05-Feb-2024 00:00	----	----
Compound	CAS Number	LOR	Unit		ES2404914-006	ES2404914-007	ES2404914-008	-----	-----
					Result	Result	Result	----	----
EP080S: TPH(V)/BTEX Surrogates - Continued									
4-Bromofluorobenzene	460-00-4	2	%		----	119	134	----	----



Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	72	143
Toluene-D8	2037-26-5	75	131
4-Bromofluorobenzene	460-00-4	73	137



QUALITY CONTROL REPORT

Work Order : **ES2404914**

Page : 1 of 11

Client : **GHD PTY LTD**

Laboratory : Environmental Division Sydney

Contact : **MR HENRY LUO**

Contact : Samiksha Sathish

Address : **LEVEL 15, 133 CASTLEREAGH STREET
SYDNEY NSW, AUSTRALIA 2000**

Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : +61 02 9239 7100

Telephone : +61-2-8784 8555

Project : **M12 GROUNDWATER**

Date Samples Received : 14-Feb-2024

Order number : **12554717**

Date Analysis Commenced : 15-Feb-2024

C-O-C number : ----

Issue Date : 22-Feb-2024

Sampler : **ANDREW DUVAL, Jackson Miller**

Site : ----

Quote number : **SY/322/21**

No. of samples received : 8

No. of samples analysed : 8



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
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW



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

* = The final LOR has been raised due to dilution or other sample specific cause; adjusted LOR is shown in brackets. The duplicate ranges for Acceptable RPD% are applied to the final LOR where applicable.

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**

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: 5609107)									
ES2404634-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	190	170	10.7	0% - 50%
ES2404691-002	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	138	127	8.5	0% - 50%
ES2404844-002	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	840	942	11.5	0% - 20%
ES2404914-004	BH145R	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	14500	12700	13.0	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 5609108)									
ES2404634-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	5	8	46.2	No Limit
ES2404691-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
ES2404844-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
ES2404914-004	BH145R	EA025H: Suspended Solids (SS)	----	5	mg/L	115	112	2.2	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 5606844)									
ES2404724-001	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	54	48	10.6	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	54	48	10.6	0% - 20%
ES2404509-001	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	6050	6070	0.3	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	6050	6070	0.3	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 5606848)									
EW2400755-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	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 (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 5606848) - continued									
EW2400755-001	Anonymous	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	6	6	0.0	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	6	6	0.0	No Limit
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 5604379)									
ES2404784-005	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.0	No Limit
ME2400306-004	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	5	2	86.0	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 5604378)									
ES2404784-005	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	8	8	0.0	No Limit
ME2400306-004	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	32	32	0.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 5606532)									
ES2404727-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	11	11	0.0	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	4	4	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	26	26	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.0	No Limit
ES2404727-011	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	52	52	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	12	12	0.0	0% - 50%
		ED093F: Sodium	7440-23-5	1	mg/L	27	27	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	4	4	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5606531)									
ES2404727-001	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	0.005	0.005	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.002	0.002	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: Manganese	7439-96-5	0.001	mg/L	0.087	0.086	0.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.007	0.006	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.024	0.025	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	2.35	2.35	0.0	0% - 20%
ES2404727-011	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	0.009	0.009	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.002	0.002	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: Manganese	7439-96-5	0.001	mg/L	0.172	0.172	0.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.002	0.003	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.019	0.019	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	6.62	6.63	0.0	0% - 20%

EG035F: Dissolved Mercury by FIMS (QC Lot: 5608242)



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 (%)
EG035F: Dissolved Mercury by FIMS (QC Lot: 5608242) - continued									
ES2404847-002	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2405015-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5606907)									
ES2404913-004	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2404913-014	Anonymous	EG035T: 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: 5608071)									
ES2404913-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.05	0.05	0.0	No Limit
ES2404913-010	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.06	0.05	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 5604381)									
ES2404914-001	BH104R	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.08	0.08	0.0	No Limit
ME2400306-004	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.02	0.02	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 5608072)									
ES2404913-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.14	0.14	0.0	0% - 50%
ES2404913-010	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.02	0.02	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 5608074)									
ES2404913-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1 (1.0)*	mg/L	1.5	1.1	32.4	No Limit
ES2404913-011	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	2.1	2.0	0.0	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 5608073)									
ES2404913-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01 (0.10)*	mg/L	0.20	0.30	39.0	No Limit
ES2404913-011	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.12	0.11	9.3	0% - 50%
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 5604380)									
ES2404913-010	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.02	0.02	0.0	No Limit
ES2404913-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5605381)									
ES2404814-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES2404914-003	BH112R	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5605381)									
ES2404814-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
ES2404914-003	BH112R	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 5605381)									
ES2404814-001	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	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	106-42-3	2	µg/L	<2	<2	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: BTEXN (QC Lot: 5605381) - continued									
ES2404814-001	Anonymous	EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
ES2404914-003	BH112R	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	2	µg/L	<2	<2	0.0	No Limit
		106-42-3							
		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**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 5609107)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	106	87.0	109
				<10	293 mg/L	118	75.2	126
				<10	2470 mg/L	94.9	83.0	124
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 5609108)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	101	83.0	129
				<5	1000 mg/L	98.6	82.0	110
				<5	841 mg/L	109	83.0	118
ED037P: Alkalinity by PC Titrator (QCLot: 5606844)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	103	81.0	115
				----	50 mg/L	106	80.0	120
ED037P: Alkalinity by PC Titrator (QCLot: 5606848)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	103	81.0	115
				----	50 mg/L	106	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 5604379)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	100	82.0	122
				<1	500 mg/L	102	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 5604378)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	103	80.9	127
				<1	1000 mg/L	91.1	80.9	127
ED093F: Dissolved Major Cations (QCLot: 5606532)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	102	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	100.0	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	100	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	103	85.0	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 5606531)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	96.0	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	106	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	102	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	96.1	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	95.9	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	105	82.0	110

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 5606531) - continued								
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	92.4	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	97.8	81.0	117
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	104	82.0	112
EG020F: Dissolved Metals by ICP-MS (QCLot: 5608239)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	94.2	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	93.7	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	94.7	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	97.6	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	91.7	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	95.4	82.0	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	98.0	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	101	81.0	117
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	94.3	82.0	112
EG020T: Total Metals by ICP-MS (QCLot: 5606495)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	99.6	82.0	114
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	99.4	84.0	112
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	98.5	86.0	116
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	95.6	83.0	118
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	97.5	85.0	115
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	95.5	84.0	116
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	96.4	79.0	117
EG035F: Dissolved Mercury by FIMS (QCLot: 5606533)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	102	83.0	105
EG035F: Dissolved Mercury by FIMS (QCLot: 5608242)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	100	83.0	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5606907)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	106	77.0	111
EK055G: Ammonia as N by Discrete Analyser (QCLot: 5608071)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	99.6	90.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5604381)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	94.1	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5608072)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	101	91.0	113
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5608074)								



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5608074) - continued								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	91.9	69.0	101
				<0.1	1 mg/L	94.2	70.0	118
				<0.1	5 mg/L	101	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5608073)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	98.7	71.3	126
				<0.01	0.442 mg/L	96.8	71.3	126
				<0.01	1 mg/L	107	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 5604380)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	103	85.0	117
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5604351)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	71.7	53.7	97.0
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	78.6	63.3	107
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	91.6	58.3	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5605381)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	87.7	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5604351)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	72.9	53.9	95.5
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	80.1	57.8	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	98.3	50.5	115
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5605381)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	91.8	75.0	127
EP080: BTEXN (QCLot: 5605381)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	95.2	68.3	119
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	101	73.5	120
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	106	73.8	122
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	113	73.0	122
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	106	76.4	123
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	101	75.5	124

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**

Matrix Spike (MS) Report

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: 5604379)							
ES2404784-005	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	95.0	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 5604378)							
ES2404784-005	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	87.5	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 5606531)							
ES2404727-002	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	95.3	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	108	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	104	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	97.8	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	98.2	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	107	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	93.5	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	98.1	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 5608239)							
ES2404847-001	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	101	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	101	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	99.9	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	106	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	98.3	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	105	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	98.3	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	99.9	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 5606495)							
ES2404913-006	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	96.0	70.0	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	94.6	70.0	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	96.7	70.0	130
		EG020A-T: Copper	7440-50-8	1 mg/L	98.8	70.0	130
		EG020A-T: Lead	7439-92-1	1 mg/L	97.1	70.0	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	91.0	70.0	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	92.8	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 5606533)							
ES2404727-005	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	84.2	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 5608242)							
ES2404847-003	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	83.0	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5606907)							
ES2404913-005	Anonymous	EG035T: Mercury	7439-97-6	0.01 mg/L	83.6	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 5608071)							

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 Work Order : ES2404914
 Client : GHD PTY LTD
 Project : M12 GROUNDWATER



Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike Concentration	SpikeRecovery(%) MS	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number			Low	High
EK055G: Ammonia as N by Discrete Analyser (QCLot: 5608071) - continued							
ES2404913-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	99.9	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5604381)							
ES2404914-001	BH104R	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	108	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5608072)							
ES2404913-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	99.6	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5608074)							
ES2404913-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	50 mg/L	99.3	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5608073)							
ES2404913-002	Anonymous	EK067G: Total Phosphorus as P	----	10 mg/L	104	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 5604380)							
ES2404913-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	98.5	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5605381)							
ES2404814-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	97.7	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5605381)							
ES2404814-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	98.5	70.0	130
EP080: BTEXN (QCLot: 5605381)							
ES2404814-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	104	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	106	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	112	70.0	130
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	120	70.0	130
			106-42-3				
		EP080: ortho-Xylene	95-47-6	25 µg/L	111	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	99.0	70.0	130



QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES2404914	Page	: 1 of 10
Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HENRY LUO	Telephone	: +61-2-8784 8555
Project	: M12 GROUNDWATER	Date Samples Received	: 14-Feb-2024
Site	: ----	Issue Date	: 22-Feb-2024
Sampler	: ANDREW DUVAL, Jackson Miller	No. of samples received	: 8
Order number	: 12554717	No. of samples analysed	: 8

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.
- **NO** Matrix Spike outliers occur.
- 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 : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)						
TRH - Semivolatile Fraction	EP071	0	6	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)						
TRH - Semivolatile Fraction	EP071	0	6	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	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		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) BH104R, BH112R	BH107R,	13-Feb-2024	----	----	----	19-Feb-2024	20-Feb-2024	✓
Clear Plastic Bottle - Natural (EA015H) BH145R		14-Feb-2024	----	----	----	19-Feb-2024	21-Feb-2024	✓
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H) BH104R, BH112R	BH107R,	13-Feb-2024	----	----	----	19-Feb-2024	20-Feb-2024	✓
Clear Plastic Bottle - Natural (EA025H) BH145R		14-Feb-2024	----	----	----	19-Feb-2024	21-Feb-2024	✓
EA065: Total Hardness as CaCO3								
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BH104R, BH112R	BH107R,	13-Feb-2024	----	----	----	16-Feb-2024	12-Mar-2024	✓
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BH145R		14-Feb-2024	----	----	----	16-Feb-2024	13-Mar-2024	✓
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P) BH104R, BH112R	BH107R,	13-Feb-2024	----	----	----	16-Feb-2024	27-Feb-2024	✓
Clear Plastic Bottle - Natural (ED037-P) BH145R		14-Feb-2024	----	----	----	16-Feb-2024	28-Feb-2024	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G) BH104R, BH112R	BH107R,	13-Feb-2024	----	----	----	15-Feb-2024	12-Mar-2024	✓
Clear Plastic Bottle - Natural (ED041G) BH145R		14-Feb-2024	----	----	----	15-Feb-2024	13-Mar-2024	✓
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G) BH104R, BH112R	BH107R,	13-Feb-2024	----	----	----	15-Feb-2024	12-Mar-2024	✓
Clear Plastic Bottle - Natural (ED045G) BH145R		14-Feb-2024	----	----	----	15-Feb-2024	13-Mar-2024	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BH104R, BH112R	BH107R,	13-Feb-2024	----	----	----	16-Feb-2024	12-Mar-2024	✓
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BH145R		14-Feb-2024	----	----	----	16-Feb-2024	13-Mar-2024	✓
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) BH104R, BH112R	BH107R,	13-Feb-2024	----	----	----	16-Feb-2024	11-Aug-2024	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) GWDUP1		13-Feb-2024	----	----	----	19-Feb-2024	11-Aug-2024	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) BH145R		14-Feb-2024	----	----	----	16-Feb-2024	12-Aug-2024	✓
EG020T: Total Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T) GWRB1		13-Feb-2024	16-Feb-2024	11-Aug-2024	✓	16-Feb-2024	11-Aug-2024	✓
EG035F: Dissolved Mercury by FIMS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) BH104R, BH112R	BH107R,	13-Feb-2024	----	----	----	19-Feb-2024	12-Mar-2024	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) GWDUP1		13-Feb-2024	----	----	----	20-Feb-2024	12-Mar-2024	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) BH145R		14-Feb-2024	----	----	----	19-Feb-2024	13-Mar-2024	✓
EG035T: Total Recoverable Mercury by FIMS								
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG035T) GWRB1		13-Feb-2024	----	----	----	19-Feb-2024	12-Mar-2024	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EK055G: Ammonia as N by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK055G) BH104R, BH112R	BH107R,	13-Feb-2024	----	----	----	19-Feb-2024	12-Mar-2024	✓
Clear Plastic Bottle - Sulfuric Acid (EK055G) BH145R		14-Feb-2024	----	----	----	19-Feb-2024	13-Mar-2024	✓
EK057G: Nitrite as N by Discrete Analyser								
Clear Plastic Bottle - Natural (EK057G) BH104R, BH112R	BH107R,	13-Feb-2024	----	----	----	15-Feb-2024	15-Feb-2024	✓
Clear Plastic Bottle - Natural (EK057G) BH145R		14-Feb-2024	----	----	----	15-Feb-2024	16-Feb-2024	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK059G) BH104R, BH112R	BH107R,	13-Feb-2024	----	----	----	19-Feb-2024	12-Mar-2024	✓
Clear Plastic Bottle - Sulfuric Acid (EK059G) BH145R		14-Feb-2024	----	----	----	19-Feb-2024	13-Mar-2024	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK061G) BH104R, BH112R	BH107R,	13-Feb-2024	19-Feb-2024	12-Mar-2024	✓	19-Feb-2024	12-Mar-2024	✓
Clear Plastic Bottle - Sulfuric Acid (EK061G) BH145R		14-Feb-2024	19-Feb-2024	13-Mar-2024	✓	19-Feb-2024	13-Mar-2024	✓
EK067G: Total Phosphorus as P by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK067G) BH104R, BH112R	BH107R,	13-Feb-2024	19-Feb-2024	12-Mar-2024	✓	19-Feb-2024	12-Mar-2024	✓
Clear Plastic Bottle - Sulfuric Acid (EK067G) BH145R		14-Feb-2024	19-Feb-2024	13-Mar-2024	✓	19-Feb-2024	13-Mar-2024	✓
EK071G: Reactive Phosphorus as P by discrete analyser								
Clear Plastic Bottle - Natural (EK071G) BH104R, BH112R	BH107R,	13-Feb-2024	----	----	----	15-Feb-2024	15-Feb-2024	✓
Clear Plastic Bottle - Natural (EK071G) BH145R		14-Feb-2024	----	----	----	15-Feb-2024	16-Feb-2024	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071) BH104R, BH112R	BH107R,	13-Feb-2024	16-Feb-2024	20-Feb-2024	✔	20-Feb-2024	27-Mar-2024	✔
Amber Glass Bottle - Unpreserved (EP071) BH145R		14-Feb-2024	16-Feb-2024	21-Feb-2024	✔	20-Feb-2024	27-Mar-2024	✔
Amber VOC Vial - Sulfuric Acid (EP080) Trip Blank		05-Feb-2024	16-Feb-2024	19-Feb-2024	✔	16-Feb-2024	19-Feb-2024	✔
Amber VOC Vial - Sulfuric Acid (EP080) BH104R, BH112R	BH107R,	13-Feb-2024	16-Feb-2024	27-Feb-2024	✔	16-Feb-2024	27-Feb-2024	✔
Amber VOC Vial - Sulfuric Acid (EP080) BH145R		14-Feb-2024	16-Feb-2024	28-Feb-2024	✔	16-Feb-2024	28-Feb-2024	✔
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071) BH104R, BH112R	BH107R,	13-Feb-2024	16-Feb-2024	20-Feb-2024	✔	20-Feb-2024	27-Mar-2024	✔
Amber Glass Bottle - Unpreserved (EP071) BH145R		14-Feb-2024	16-Feb-2024	21-Feb-2024	✔	20-Feb-2024	27-Mar-2024	✔
Amber VOC Vial - Sulfuric Acid (EP080) Trip Blank		05-Feb-2024	16-Feb-2024	19-Feb-2024	✔	16-Feb-2024	19-Feb-2024	✔
Amber VOC Vial - Sulfuric Acid (EP080) BH104R, BH112R	BH107R,	13-Feb-2024	16-Feb-2024	27-Feb-2024	✔	16-Feb-2024	27-Feb-2024	✔
Amber VOC Vial - Sulfuric Acid (EP080) BH145R		14-Feb-2024	16-Feb-2024	28-Feb-2024	✔	16-Feb-2024	28-Feb-2024	✔
EP080: BTEXN								
Amber VOC Vial - Sulfuric Acid (EP080) Trip Spike - 16,	Trip Blank	05-Feb-2024	16-Feb-2024	19-Feb-2024	✔	16-Feb-2024	19-Feb-2024	✔
Amber VOC Vial - Sulfuric Acid (EP080) BH104R, BH112R	BH107R,	13-Feb-2024	16-Feb-2024	27-Feb-2024	✔	16-Feb-2024	27-Feb-2024	✔
Amber VOC Vial - Sulfuric Acid (EP080) BH145R		14-Feb-2024	16-Feb-2024	28-Feb-2024	✔	16-Feb-2024	28-Feb-2024	✔



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	3	27	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	4	32	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	35	11.43	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	40	10.00	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 Mercury by FIMS	EG035T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	6	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	4	27	14.81	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	32	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	35	5.71	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	5	40	12.50	12.50	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	5	40	12.50	12.50	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	19	15.79	15.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	20	15.00	15.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	6	16.67	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	
Laboratory Control Samples (LCS) - Continued							
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	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	32	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	35	5.71	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	40	5.00	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 Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	6	16.67	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	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	32	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	35	5.71	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	5.56	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 Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	6	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)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. 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 thiocyanate forms highly-coloured ferric thiocyanate 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 0.45um 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.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. 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 0.45um 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).



Analytical Methods	Method	Matrix	Method Descriptions
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ 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-NH ₃ 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-NO ₂ - 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-NO ₃ - F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined separately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NO _x) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO ₃ - F. Combined oxidised Nitrogen (NO ₂ +NO ₃) 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-NO ₃ -. 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)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with orthophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO ₄ 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)
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)

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)

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Work Order : ES2404914
Client : GHD PTY LTD
Project : M12 GROUNDWATER



Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. 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.

HT



CHAIN OF CUSTODY

ALS Laboratory, please tick →

CLIENT: GHD Pty Ltd

OFFICE: Sydney

PROJECT: M12 Groundwater

ORDER NUMBER: 12554717

PROJECT MANAGER: Henry Luo

TURNAROUND REQUIREME ☐ Standard TAT (List due date):

(Standard TAT may be longer for some tests e.g., Ultra Trace) ☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.: SY/322/21

CONTACT PH: Henry Luo 0414 090 002

STANDARD TAT

COC SEQUENCE NUMBER (Circle)

COC: 1 2 3 4 5 6 7

DF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comment:

SAMPLER: Emily Smith, Andrew Duval

COC emailed to ALS? (YES / NO)

Email Reports to: emily.smith@ghd.com; andrew.duval@ghd.com; henry.luo@ghd.com, ghdlabreports@ghd.com

SAMPLER MOBILE: 0431 522 928

EDD FORMAT (or default): ESDAT

RELINQUISHED BY:

DATE/TIME:

RECEIVED BY:

DATE/TIME:

RELINQUISHED BY:

DATE/TIME:

RECEIVED BY:

DATE/TIME: 15/3/24 18:00

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

PLEASE DO NOT LOG ALL SAMPLES RECEIVED IN ONE WORKORDER. LOG AS TWO SEPARATE WORKORDERS AS PER THE TWO COCs PROVIDED.

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required)											
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	Comments	TOTAL CONTAINERS	W-02 (dissolved 8 metals)	EG020F (dissolved Fe, Mn)	W-04 (TRH/BTEXN)	NT-06A (TN, NO2, NO3, NH3, TP, soluble Reactive P)	NT-01D & 02 (major cations & anions, Hardness)	EA015H (TDS)	EA025H (TSS)	EP075A (SIM) Phenols - Standard level (15 analytes)	W-02T (8 total metals)	BTEXN		
1	BH104R		Water		6	X	X	X	X	X	X	X					
2	BH107R		Water		6	X	X	X	X	X	X	X					
3	BH112R		Water		6	X	X	X	X	X	X	X					
4	BH145R		Water		6	X	X	X	X	X	X	X					
5	GWDUP1		Water		1	X											
FWP	GWDUP2		Water	PLEASE FORWARD TO EUROFINS WITH ATTACHED COC	1												
6	GWRB1		Water	Sample Forwarded Lab Split WO	1									X			
7	Trip spike		Water	Lab Analysis: Eurofins - 1 GWDUP2											X		
8	Trip blank		Water	Organised By / Date:	1										X		
				Relinquished By / Date:													
				Connote / Courier:													
				WO No:													

Environmental Division

Sydney

Work Order Reference

ES2408629



Telephone : + 61-2-8784 8555

Attached By PO / Internal Sheet:



mgt

☐ **Sydney**

Unit F3 - 6 Building F, 16 Mars Road, Lane Cove
Phone: +612 9900 8400
Email: enviro.syd@mgllabmark.com.au

☐ **Brisbane**

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☐ **Melbourne**

2 Kingston Town Close, Oakleigh, VIC 3166
Phone: +613 8564 5000 Fax: +613 8564 5090
Email: enquiries.melb@mgllabmark.com.au

CHAIN OF CUSTODY RECORD**CLIENT DETAILS**Page 1 of 1

Company Name : GHD Pty Ltd, Sydney				Contact Name : Andrew Duval 0468 301 344				Purchase Order : 12554717				COC Number :															
Office Address :				Project Manager: Henry Luo 0414 090 002				PROJECT Number : 12554717				Eurofins mgt quote ID :															
Level 15, 133 Castlereagh Street, Sydney NSW 2000				Email for results : emily.smith@ghd.com; andrew.duval@ghd.com; henry.luo@ghd.com; ghdlabreports@ghd.com				PROJECT Name : M12 Water Sampling				Data output format: ESDAT															
Special Directions & Comments : Sent from ALS				Analytes				Some common holding times (with correct preservation). For further information contact the lab																			
								Waters				Soils															
								BTEX, MAH, VOC				14 days				BTEX, MAH, VOC				14 days							
								TRH, PAH, Phenols, Pesticides				7 days				TRH, PAH, Phenols, Pesticides				14 days							
								Heavy Metals				6 months				Heavy Metals				6 months							
Mercury, CrVI				28 days				Mercury, CrVI				28 days															
Microbiological testing				24 hours				Microbiological testing				72 hours															
BOD, Nitrate, Nitrite, Total N				2 days				Anions				28 days															
Solids - TSS, TDS etc				7 days				SPOCAS, pH Field and FOX, CrS				24 hours															
Ferrous iron				7 days				ASLP, TCLP				7 days															
Eurofins mgt DI water batch number:				Dissolved metals				Total metals				Containers:								Sample comments:							
												500P 250P 60P 1LA 40mL vial 200mL A Jar Bag															
1 SWDUP2 14/03/2024 Water												X				1											
2 GWDUP2 15/03/2024 Water												X				1											
3																											
4																											
5																											
6																											
7																											
8																											
9																											
10																											
Relinquished By: Emily Smith				Received By:				Method Of Shipment								Temperature on arrival:											
Date & Time : 15/03/2024 17:45				Date & Time :				☐ Courier ☐ Hand Delivered ☐ Postal								Report number:											
Signature:				Signature:				Courier Consignment # :																			



SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2408629**

Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HENRY LUO	Contact	: Samiksha Sathish
Address	: LEVEL 15, 133 CASTLEREAGH STREET SYDNEY NSW, AUSTRALIA 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: henry.luo@ghd.com	E-mail	: samiksha.sathish@alsglobal.com
Telephone	: +61 02 9239 7100	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 9239 7199	Facsimile	: +61-2-8784 8500
Project	: 12554717	Page	: 1 of 3
Order number	: 12554717	Quote number	: ES2021GHDSE0026 (SY/322/21)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: Andrew Duval, Emily Smith		

Dates

Date Samples Received	: 15-Mar-2024 18:00	Issue Date	: 18-Mar-2024
Client Requested Due Date	: 25-Mar-2024	Scheduled Reporting Date	: 25-Mar-2024

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: 7	Temperature	: 7.0, 6.8, 11.2°C
Receipt Detail	:	No. of samples received / analysed	: 8 / 8

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- This is an updated SRN which indicates the change in due date for sample 004, BH145R and 005, GWDUP1 as per the updated COC
- **Sample GWDUP2 has been forwarded to Eurofins.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EG020F Dissolved Metals by ICP/MS	WATER - NT-01D & 02 Major Cations & Anions (Ca, Mg, Na, K, Cl, SO ₄ ,)	WATER - NT-08A Total Nitrogen + NO ₂ + NO ₃ + NH ₃ + Total P +	WATER - W-02 8 Metals	WATER - W-04 TRH/BTEXN
ES2408629-001	15-Mar-2024 00:00	BH104R	✓	✓	✓	✓	✓	✓	✓
ES2408629-002	15-Mar-2024 00:00	BH107R	✓	✓	✓	✓	✓	✓	✓
ES2408629-003	15-Mar-2024 00:00	BH112R	✓	✓	✓	✓	✓	✓	✓
ES2408629-004	14-Mar-2024 00:00	BH145R	✓	✓	✓	✓	✓	✓	✓
ES2408629-005	14-Mar-2024 00:00	GWDUP1						✓	

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP080 BTEXN	WATER - W-02T 8 metals (Total)	WATER - W-18 TRH(C6 - C9)/BTEXN
ES2408629-006	15-Mar-2024 00:00	GWRB1		✓	
ES2408629-007	11-Mar-2024 00:00	Trip Spike	✓		
ES2408629-008	11-Mar-2024 00:00	Trip Blank			✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.



CERTIFICATE OF ANALYSIS

Work Order : **ES2408629**
Client : **GHD PTY LTD**
Contact : **MR HENRY LUO**
Address : **LEVEL 15, 133 CASTLEREAGH STREET**
SYDNEY NSW, AUSTRALIA 2000
Telephone : **+61 02 9239 7100**
Project : **12554717**
Order number : **12554717**
C-O-C number : **----**
Sampler : **Andrew Duval, Emily Smith**
Site : **----**
Quote number : **SY/322/21**
No. of samples received : **8**
No. of samples analysed : **8**

Page : 1 of 7
Laboratory : Environmental Division Sydney
Contact : Samiksha Sathish
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 15-Mar-2024 18:00
Date Analysis Commenced : 17-Mar-2024
Issue Date : 25-Mar-2024 15:16



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
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW



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.

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene 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.
- EP080: Sample TRIP SPIKE contains volatile compounds spiked into the sample containers prior to dispatch from the laboratory. BTEXN compounds spiked at 20 ug/L.
- 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.
- 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.



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time				15-Mar-2024 00:00	15-Mar-2024 00:00	15-Mar-2024 00:00	14-Mar-2024 00:00	14-Mar-2024 00:00
Compound	CAS Number	LOR	Unit	ES2408629-001	ES2408629-002	ES2408629-003	ES2408629-004	ES2408629-005
				Result	Result	Result	Result	Result
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	4730	2120	9900	11900	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	135	65	52	38	----
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	920	568	2330	2920	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	89	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	1080	1480	1350	1070	----
Total Alkalinity as CaCO3	----	1	mg/L	1080	1570	1350	1070	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	197	197	1740	372	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	2170	272	4320	6170	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	144	43	270	254	----
Magnesium	7439-95-4	1	mg/L	136	112	403	554	----
Sodium	7440-23-5	1	mg/L	1600	709	2910	3190	----
Potassium	7440-09-7	1	mg/L	18	15	42	19	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	0.004	<0.001	0.003	0.003	0.003
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	0.003	0.009	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	0.002	0.006	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	0.011	0.017	<0.005	<0.005



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time					15-Mar-2024 00:00	15-Mar-2024 00:00	15-Mar-2024 00:00	14-Mar-2024 00:00	14-Mar-2024 00:00
Compound	CAS Number	LOR	Unit		ES2408629-001	ES2408629-002	ES2408629-003	ES2408629-004	ES2408629-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Manganese	7439-96-5	0.001	mg/L		0.190	0.005	0.086	0.136	----
Iron	7439-89-6	0.05	mg/L		1.91	<0.05	<0.05	3.23	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		1.57	<0.01	2.51	2.23	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.01	<0.01	0.02	<0.01	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	2.40	0.26	0.16	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.01	2.40	0.28	0.16	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		2.0	1.0	2.9	2.3	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
[^] Total Nitrogen as N	----	0.1	mg/L		2.0	3.4	3.2	2.5	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.16	0.04	0.11	0.03	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	0.08	<0.01	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		86.9	43.1	185	203	----
∅ Total Cations	----	0.01	meq/L		88.4	42.6	174	198	----
∅ Ionic Balance	----	0.01	%		0.88	0.65	3.00	1.41	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	----
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID				BH104R	BH107R	BH112R	BH145R	GWDUP1
Sampling date / time				15-Mar-2024 00:00	15-Mar-2024 00:00	15-Mar-2024 00:00	14-Mar-2024 00:00	14-Mar-2024 00:00
Compound	CAS Number	LOR	Unit	ES2408629-001	ES2408629-002	ES2408629-003	ES2408629-004	ES2408629-005
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued								
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	----
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	----
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	----
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	----
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	102	99.2	103	99.0	----
Toluene-D8	2037-26-5	2	%	98.0	97.8	97.5	95.9	----
4-Bromofluorobenzene	460-00-4	2	%	115	116	115	111	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				GWRB1	Trip Spike	Trip Blank	----	----
Sampling date / time				15-Mar-2024 00:00	11-Mar-2024 00:00	11-Mar-2024 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2408629-006	ES2408629-007	ES2408629-008	-----	-----
				Result	Result	Result	----	----
EG020T: Total 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	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	----	----	<20	----	----
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	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	----	18	<1	----	----
Toluene	108-88-3	2	µg/L	----	15	<2	----	----
Ethylbenzene	100-41-4	2	µg/L	----	15	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	----	16	<2	----	----
ortho-Xylene	95-47-6	2	µg/L	----	17	<2	----	----
[^] Total Xylenes	----	2	µg/L	----	33	<2	----	----
[^] Sum of BTEX	----	1	µg/L	----	81	<1	----	----
Naphthalene	91-20-3	5	µg/L	----	19	<5	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	----	99.5	97.0	----	----
Toluene-D8	2037-26-5	2	%	----	95.5	90.9	----	----
4-Bromofluorobenzene	460-00-4	2	%	----	110	107	----	----



Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	72	143
Toluene-D8	2037-26-5	75	131
4-Bromofluorobenzene	460-00-4	73	137



QUALITY CONTROL REPORT

Work Order	: ES2408629	Page	: 1 of 12
Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HENRY LUO	Contact	: Samiksha Sathish
Address	: LEVEL 15, 133 CASTLEREAGH STREET SYDNEY NSW, AUSTRALIA 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 9239 7100	Telephone	: +61-2-8784 8555
Project	: 12554717	Date Samples Received	: 15-Mar-2024
Order number	: 12554717	Date Analysis Commenced	: 17-Mar-2024
C-O-C number	: ----	Issue Date	: 25-Mar-2024
Sampler	: Andrew Duval, Emily Smith		
Site	: ----		
Quote number	: SY/322/21		
No. of samples received	: 8		
No. of samples analysed	: 8		



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
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW



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

* = The final LOR has been raised due to dilution or other sample specific cause; adjusted LOR is shown in brackets. The duplicate ranges for Acceptable RPD% are applied to the final LOR where applicable.

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: 5675460)									
ES2408373-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	476	466	2.2	0% - 20%
ES2408629-002	BH107R	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	2120	2110	0.5	0% - 20%
ES2408635-009	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	816	802	1.7	0% - 20%
ES2408659-003	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	361	374	3.5	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 5679171)									
ES2408552-006	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	788	786	0.3	0% - 20%
ES2408791-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	2180	2140	2.1	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 5675461)									
ES2408373-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
ES2408629-002	BH107R	EA025H: Suspended Solids (SS)	----	5	mg/L	65	64	2.3	0% - 50%
ES2408635-009	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	11	11	0.0	No Limit
ES2408659-003	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 5679172)									
ES2408552-006	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	9	10	12.7	No Limit
ES2408791-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	906	868	4.4	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 5672181)									
ES2408150-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	46	46	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO ₃	----	1	mg/L	46	46	0.0	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 (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 5672181) - continued									
ES2408210-004	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	14	14	0.0	0% - 50%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	14	14	0.0	0% - 50%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 5667435)									
ES2408555-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	183	182	0.0	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 5667431)									
ES2408496-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	3010	3060	1.7	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 5676163)									
ES2408150-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	15	15	0.0	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	<1	<1	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	2	2	0.0	No Limit
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.0	No Limit
ES2408856-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	67	66	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	8	7	13.1	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	34	30	10.7	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	6	6	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5676162)									
ES2408150-001	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	0.002	0.002	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: Manganese	7439-96-5	0.001	mg/L	0.001	0.002	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
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
ES2408856-001	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: Manganese	7439-96-5	0.001	mg/L	0.018	0.018	0.0	0% - 50%
		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
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.21	0.20	6.6	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5679481)									



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 (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5679481) - continued									
ES2409411-004	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	0.002	0.002	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.002	0.002	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
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
ES2408890-001	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	0.004	0.004	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	1.16	1.14	2.1	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.017	0.018	0.0	0% - 50%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.052	0.052	0.0	0% - 50%
		EG020A-F: Iron	7439-89-6	0.05	mg/L	5.00	5.01	0.0	0% - 20%
EG020T: Total Metals by ICP-MS (QC Lot: 5676438)									
EN2402257-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.014	0.012	12.5	No Limit
ES2408183-005	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001 (0.0010)*	mg/L	<0.0010	<0.0010	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001 (0.010) *	mg/L	<0.010	<0.010	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001 (0.010) *	mg/L	<0.010	<0.010	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001 (0.010) *	mg/L	<0.010	<0.010	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001 (0.010) *	mg/L	<0.010	<0.010	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001 (0.010) *	mg/L	0.046	0.043	4.9	No Limit

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 Work Order : ES2408629
 Client : GHD PTY LTD
 Project : 12554717



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 (%)
EG020T: Total Metals by ICP-MS (QC Lot: 5676438) - continued									
ES2408183-005	Anonymous	EG020A-T: Zinc	7440-66-6	0.005 (0.052) *	mg/L	<0.052	<0.052	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 5676164)									
ES2408150-002	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2408629-004	BH145R	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 5679482)									
ES2408875-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EW2401288-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5681149)									
ES2408937-001	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.1 µg/L	<0.0001	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 5679406)									
ES2408150-004	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.01	<0.01	0.0	No Limit
ES2408757-002	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.06	0.06	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 5667430)									
ES2408496-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.61	0.60	0.0	0% - 20%
ES2408555-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.07	0.07	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 5667436)									
ES2408645-002	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	58.4	56.9	2.5	0% - 20%
ES2408629-002	BH107R	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: 5679407)									
ES2408150-004	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.43	0.43	0.0	0% - 20%
ES2408757-002	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.02	<0.01	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 5679403)									
ES2408150-004	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.2	0.2	0.0	No Limit
ES2408629-003	BH112R	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	2.9	2.8	3.9	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 5679402)									
ES2408150-004	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.01	<0.01	0.0	No Limit
ES2408629-003	BH112R	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.11	0.10	12.2	0% - 50%
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 5667434)									
ES2408629-002	BH107R	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2408555-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5670657)									
ES2408629-001	BH104R	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES2408696-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5670657)									
ES2408629-001	BH104R	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit

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 Work Order : ES2408629
 Client : GHD PTY LTD
 Project : 12554717



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: 5670657) - continued									
ES2408696-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 5670657)									
ES2408629-001	BH104R	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	2	µg/L	<2	<2	0.0	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
ES2408696-001	Anonymous	EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
		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	2	µg/L	<2	<2	0.0	No Limit
			106-42-3						
		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**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 5675460)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	104	87.0	109
				<10	293 mg/L	102	75.2	126
				<10	2410 mg/L	101	83.0	124
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 5679171)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	94.6	87.0	109
				<10	293 mg/L	111	75.2	126
				<10	2410 mg/L	100	83.0	124
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 5675461)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	98.3	83.0	129
				<5	1000 mg/L	101	82.0	110
				<5	928 mg/L	98.2	83.0	118
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 5679172)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	94.7	83.0	129
				<5	1000 mg/L	98.3	82.0	110
				<5	928 mg/L	94.2	83.0	118
ED037P: Alkalinity by PC Titrator (QCLot: 5672181)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	105	81.0	115
				----	50 mg/L	110	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 5667435)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	95.5	82.0	122
				<1	500 mg/L	100	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 5667431)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	101	80.9	127
				<1	1000 mg/L	106	80.9	127
ED093F: Dissolved Major Cations (QCLot: 5676163)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	102	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	106	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	104	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	102	85.0	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 5676162)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	94.4	85.0	114



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 5676162) - continued								
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	92.1	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	95.2	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	93.9	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	91.5	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	98.0	82.0	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	93.1	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	95.5	81.0	117
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	95.2	82.0	112
EG020F: Dissolved Metals by ICP-MS (QCLot: 5679481)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	99.6	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	94.9	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	94.4	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	95.7	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	93.5	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	95.0	82.0	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	94.1	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	98.5	81.0	117
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	108	82.0	112
EG020T: Total Metals by ICP-MS (QCLot: 5676438)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	102	82.0	114
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	98.2	84.0	112
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	100	86.0	116
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	102	83.0	118
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	97.6	85.0	115
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	100	84.0	116
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	104	79.0	117
EG035F: Dissolved Mercury by FIMS (QCLot: 5676164)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	86.3	83.0	105
EG035F: Dissolved Mercury by FIMS (QCLot: 5679482)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	96.9	83.0	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5681149)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	92.5	77.0	111
EK055G: Ammonia as N by Discrete Analyser (QCLot: 5679406)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	100.0	90.0	114



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5667430)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	95.8	82.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5667436)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	96.0	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5679407)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	102	91.0	113
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5679403)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	111	69.0	123
				<0.1	1 mg/L	106	70.0	123
				<0.1	5 mg/L	96.6	70.0	123
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5679402)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	108	71.3	126
				<0.01	0.442 mg/L	101	71.3	126
				<0.01	1 mg/L	104	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 5667434)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	103	85.0	117
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5668041)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	81.0	53.7	97.0
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	90.0	63.3	107
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	87.7	58.3	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5670657)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	97.1	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5668041)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	89.7	53.9	95.5
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	77.8	57.8	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	80.5	50.5	115
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5670657)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	83.3	75.0	127
EP080: BTEXN (QCLot: 5670657)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	105	68.3	119
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	94.5	73.5	120
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	95.6	73.8	122
EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	10 µg/L	102	73.0	122
	106-42-3							
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	106	76.4	123



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) LowHigh	
Method: Compound	CAS Number	LOR	Unit	Result				
EP080: BTEXN (QCLot: 5670657) - continued								
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	102	75.5	124

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**

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: 5667435)							
ES2408555-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 5667431)							
ES2408496-001	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	# Not Determined	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 5676162)							
ES2408150-002	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	116	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	114	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	113	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	115	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	115	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	123	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	115	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	114	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 5679481)							
ES2408875-001	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	105	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	99.9	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	100	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	102	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	102	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	99.2	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	99.3	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	105	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 5676438)							
EN2402257-002	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	106	70.0	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	104	70.0	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	107	70.0	130
		EG020A-T: Copper	7440-50-8	1 mg/L	106	70.0	130

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 Work Order : ES2408629
 Client : GHD PTY LTD
 Project : 12554717



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 5676438) - continued							
EN2402257-002	Anonymous	EG020A-T: Lead	7439-92-1	1 mg/L	106	70.0	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	105	70.0	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	106	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 5676164)							
ES2408150-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	84.4	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 5679482)							
ES2408629-005	GWDUP1	EG035F: Mercury	7439-97-6	0.01 mg/L	84.7	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5681149)							
ES2408629-006	GWRB1	EG035T: Mercury	7439-97-6	0.01 mg/L	82.6	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 5679406)							
ES2408150-004	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	112	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5667430)							
ES2408496-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	106	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5667436)							
ES2408629-002	BH107R	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	102	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5679407)							
ES2408150-004	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	109	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5679403)							
ES2408150-005	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	95.7	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5679402)							
ES2408150-005	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	99.6	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 5667434)							
ES2408555-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	91.5	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5670657)							
ES2408629-001	BH104R	EP080: C6 - C9 Fraction	----	325 µg/L	86.3	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5670657)							
ES2408629-001	BH104R	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	76.3	70.0	130
EP080: BTEXN (QCLot: 5670657)							
ES2408629-001	BH104R	EP080: Benzene	71-43-2	25 µg/L	89.4	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	90.3	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	80.5	70.0	130
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	82.8	70.0	130
			106-42-3				
	EP080: ortho-Xylene	95-47-6	25 µg/L	85.0	70.0	130	



Sub-Matrix: WATER

				Matrix Spike (MS) Report			
Laboratory sample ID		Sample ID	Method: Compound	CAS Number	Spike Concentration	SpikeRecovery(%) MS	Acceptable Limits (%) Low High
EP080: BTEXN (QCLot: 5670657) - continued							
ES2408629-001		BH104R	EP080: Naphthalene	91-20-3	25 µg/L	86.6	70.0 130



QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES2408629	Page	: 1 of 11
Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HENRY LUO	Telephone	: +61-2-8784 8555
Project	: 12554717	Date Samples Received	: 15-Mar-2024
Site	: ----	Issue Date	: 25-Mar-2024
Sampler	: Andrew Duval, Emily Smith	No. of samples received	: 8
Order number	: 12554717	No. of samples analysed	: 8

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

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

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

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							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	ES2408555--001	Anonymous	Sulfate as SO4 - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	ES2408496--001	Anonymous	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Matrix: WATER

Method	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EK057G: Nitrite as N by Discrete Analyser						
Clear Plastic Bottle - Natural BH145R	----	----	----	17-Mar-2024	16-Mar-2024	1
EK071G: Reactive Phosphorus as P by discrete analyser						
Clear Plastic Bottle - Natural BH145R	----	----	----	17-Mar-2024	16-Mar-2024	1

Matrix: WATER

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)						
TRH - Semivolatile Fraction	EP071	0	4	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)						
TRH - Semivolatile Fraction	EP071	0	4	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

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.

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	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		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) BH145R	14-Mar-2024	----	----	----	21-Mar-2024	21-Mar-2024	✓
Clear Plastic Bottle - Natural (EA015H) BH104R, BH112R	15-Mar-2024	----	----	----	20-Mar-2024	22-Mar-2024	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H) BH145R	14-Mar-2024	----	----	----	21-Mar-2024	21-Mar-2024	✓
Clear Plastic Bottle - Natural (EA025H) BH104R, BH112R	15-Mar-2024	----	----	----	20-Mar-2024	22-Mar-2024	✓
EA065: Total Hardness as CaCO3							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BH145R	14-Mar-2024	----	----	----	20-Mar-2024	11-Apr-2024	✓
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BH104R, BH112R	15-Mar-2024	----	----	----	20-Mar-2024	12-Apr-2024	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) BH145R	14-Mar-2024	----	----	----	22-Mar-2024	28-Mar-2024	✓
Clear Plastic Bottle - Natural (ED037-P) BH104R, BH112R	15-Mar-2024	----	----	----	22-Mar-2024	29-Mar-2024	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) BH145R	14-Mar-2024	----	----	----	17-Mar-2024	11-Apr-2024	✓
Clear Plastic Bottle - Natural (ED041G) BH104R, BH112R	15-Mar-2024	----	----	----	17-Mar-2024	12-Apr-2024	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) BH145R	14-Mar-2024	----	----	----	17-Mar-2024	11-Apr-2024	✓
Clear Plastic Bottle - Natural (ED045G) BH104R, BH112R	15-Mar-2024	----	----	----	17-Mar-2024	12-Apr-2024	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BH145R	14-Mar-2024	----	----	----	20-Mar-2024	11-Apr-2024	✓
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BH104R, BH112R	15-Mar-2024	----	----	----	20-Mar-2024	12-Apr-2024	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) BH145R	14-Mar-2024	----	----	----	20-Mar-2024	10-Sep-2024	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) GWDUP1	14-Mar-2024	----	----	----	22-Mar-2024	10-Sep-2024	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) BH104R, BH112R	BH107R, 15-Mar-2024	----	----	----	20-Mar-2024	11-Sep-2024	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T) GWRB1	15-Mar-2024	21-Mar-2024	11-Sep-2024	✓	21-Mar-2024	11-Sep-2024	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) BH145R	14-Mar-2024	----	----	----	22-Mar-2024	11-Apr-2024	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) GWDUP1	14-Mar-2024	----	----	----	25-Mar-2024	11-Apr-2024	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) BH104R, BH112R	BH107R, 15-Mar-2024	----	----	----	22-Mar-2024	12-Apr-2024	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG035T) GWRB1	15-Mar-2024	----	----	----	25-Mar-2024	12-Apr-2024	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G) BH145R	14-Mar-2024	----	----	----	22-Mar-2024	11-Apr-2024	✓
Clear Plastic Bottle - Sulfuric Acid (EK055G) BH104R, BH112R	BH107R, 15-Mar-2024	----	----	----	22-Mar-2024	12-Apr-2024	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G) BH145R	14-Mar-2024	----	----	----	17-Mar-2024	16-Mar-2024	✗
Clear Plastic Bottle - Natural (EK057G) BH104R, BH112R	BH107R, 15-Mar-2024	----	----	----	17-Mar-2024	17-Mar-2024	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G) BH145R	14-Mar-2024	----	----	----	22-Mar-2024	11-Apr-2024	✓
Clear Plastic Bottle - Sulfuric Acid (EK059G) BH104R, BH112R	BH107R, 15-Mar-2024	----	----	----	22-Mar-2024	12-Apr-2024	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G) BH145R	14-Mar-2024	22-Mar-2024	11-Apr-2024	✓	22-Mar-2024	11-Apr-2024	✓
Clear Plastic Bottle - Sulfuric Acid (EK061G) BH104R, BH112R	BH107R, 15-Mar-2024	22-Mar-2024	12-Apr-2024	✓	22-Mar-2024	12-Apr-2024	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G) BH145R	14-Mar-2024	22-Mar-2024	11-Apr-2024	✓	22-Mar-2024	11-Apr-2024	✓
Clear Plastic Bottle - Sulfuric Acid (EK067G) BH104R, BH112R	BH107R, 15-Mar-2024	22-Mar-2024	12-Apr-2024	✓	22-Mar-2024	12-Apr-2024	✓
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural (EK071G) BH145R	14-Mar-2024	----	----	----	17-Mar-2024	16-Mar-2024	✗
Clear Plastic Bottle - Natural (EK071G) BH104R, BH112R	BH107R, 15-Mar-2024	----	----	----	17-Mar-2024	17-Mar-2024	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) BH145R	14-Mar-2024	20-Mar-2024	21-Mar-2024	✓	22-Mar-2024	29-Apr-2024	✓
Amber Glass Bottle - Unpreserved (EP071) BH104R, BH112R	BH107R, 15-Mar-2024	20-Mar-2024	22-Mar-2024	✓	22-Mar-2024	29-Apr-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) Trip Blank	11-Mar-2024	19-Mar-2024	25-Mar-2024	✓	19-Mar-2024	25-Mar-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH145R	14-Mar-2024	19-Mar-2024	28-Mar-2024	✓	19-Mar-2024	28-Mar-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH104R, BH112R	BH107R, 15-Mar-2024	19-Mar-2024	29-Mar-2024	✓	19-Mar-2024	29-Mar-2024	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071) BH145R	14-Mar-2024	20-Mar-2024	21-Mar-2024	✓	22-Mar-2024	29-Apr-2024	✓
Amber Glass Bottle - Unpreserved (EP071) BH104R, BH112R	BH107R, 15-Mar-2024	20-Mar-2024	22-Mar-2024	✓	22-Mar-2024	29-Apr-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) Trip Blank	11-Mar-2024	19-Mar-2024	25-Mar-2024	✓	19-Mar-2024	25-Mar-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH145R	14-Mar-2024	19-Mar-2024	28-Mar-2024	✓	19-Mar-2024	28-Mar-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH104R, BH112R	BH107R, 15-Mar-2024	19-Mar-2024	29-Mar-2024	✓	19-Mar-2024	29-Mar-2024	✓

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP080: BTEXN								
Amber VOC Vial - Sulfuric Acid (EP080) Trip Spike,	Trip Blank	11-Mar-2024	19-Mar-2024	25-Mar-2024	✓	19-Mar-2024	25-Mar-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH145R		14-Mar-2024	19-Mar-2024	28-Mar-2024	✓	19-Mar-2024	28-Mar-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH104R, BH112R	BH107R,	15-Mar-2024	19-Mar-2024	29-Mar-2024	✓	19-Mar-2024	29-Mar-2024	✓



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	2	20	10.00	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	4	33	12.12	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	4	31	12.90	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	5	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	6	56	10.71	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	6	57	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	7	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	4	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
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	20	5.00	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	2	33	6.06	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	31	6.45	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	5	40.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	8	56	14.29	12.50	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	8	57	14.04	12.50	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	20	15.00	15.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	20	15.00	15.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	4	25.00	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	
Laboratory Control Samples (LCS) - Continued							
TRH Volatiles/BTEX	EP080	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	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	2	33	6.06	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	31	6.45	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	3	56	5.36	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	3	57	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	4	25.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	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	2	33	6.06	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	31	6.45	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	4	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	5.26	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)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. 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 thiocyanate forms highly-coloured ferric thiocyanate 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 0.45um 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.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. 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 0.45um 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).



Analytical Methods	Method	Matrix	Method Descriptions
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ 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-NH ₃ 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-NO ₂ - 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-NO ₃ - F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined separately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NO _x) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO ₃ - F. Combined oxidised Nitrogen (NO ₂ +NO ₃) 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-NO ₃ -. 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)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with orthophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO ₄ 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)
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)
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)

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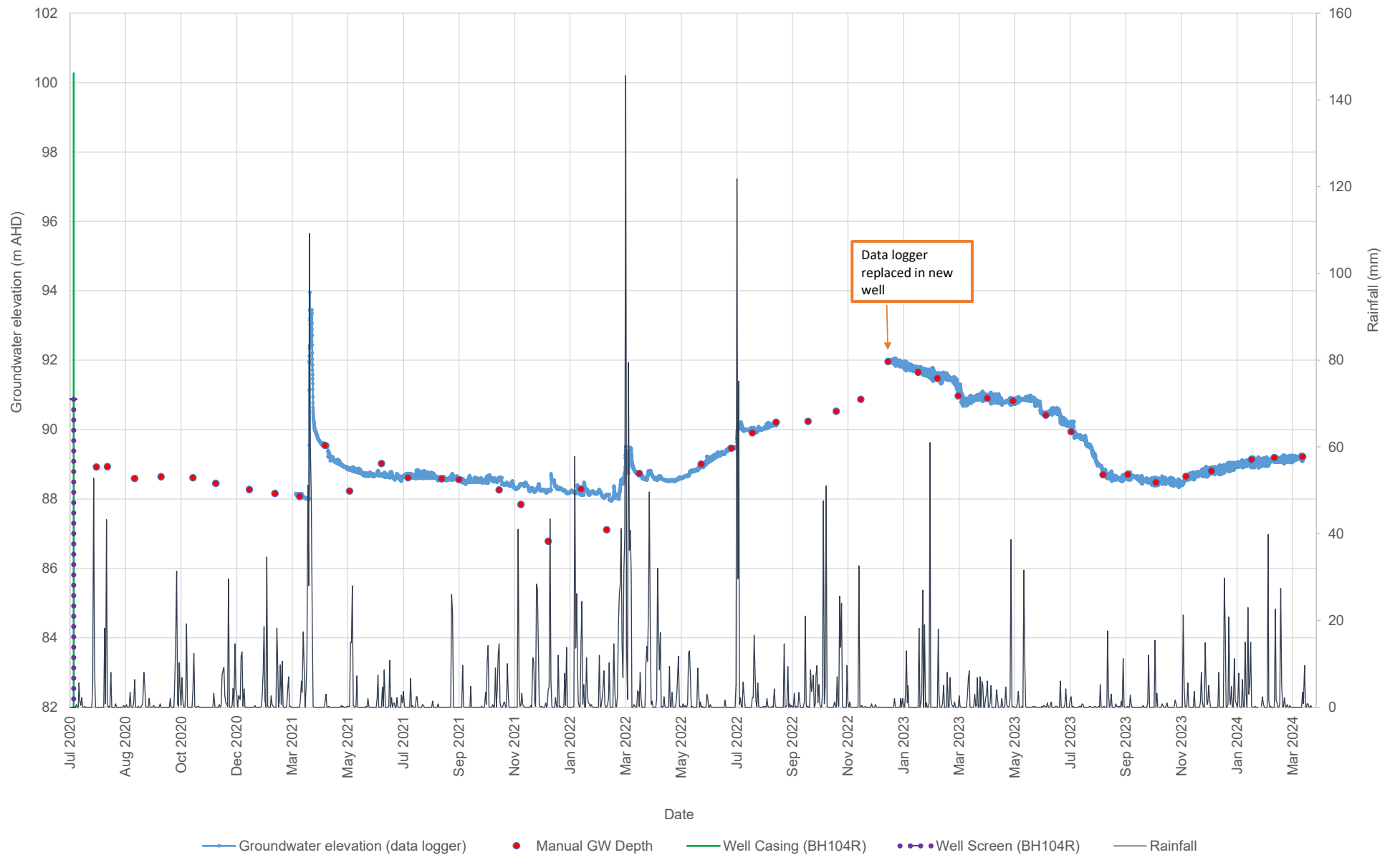


Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method 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.

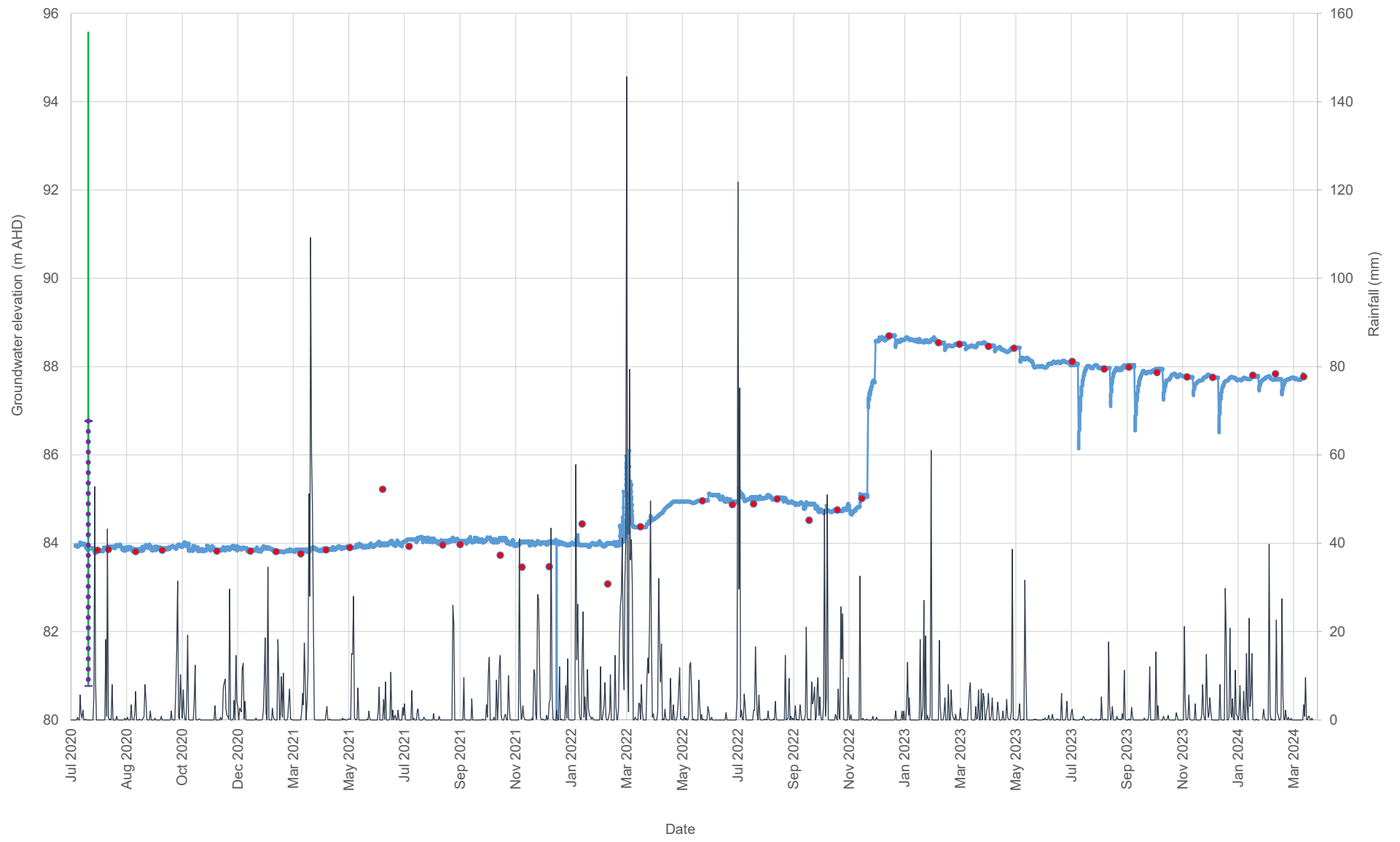
Appendix I

Groundwater level plots

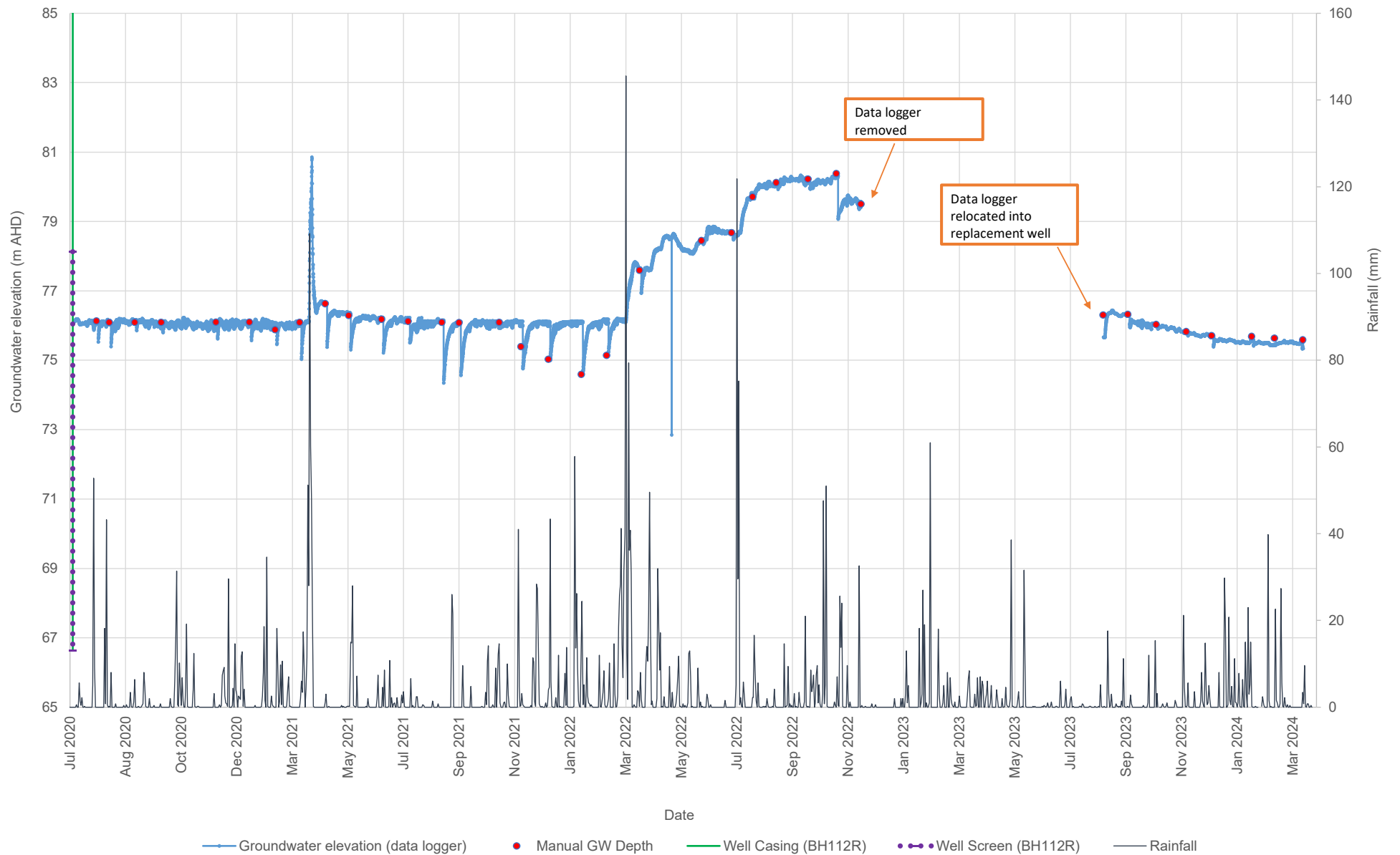
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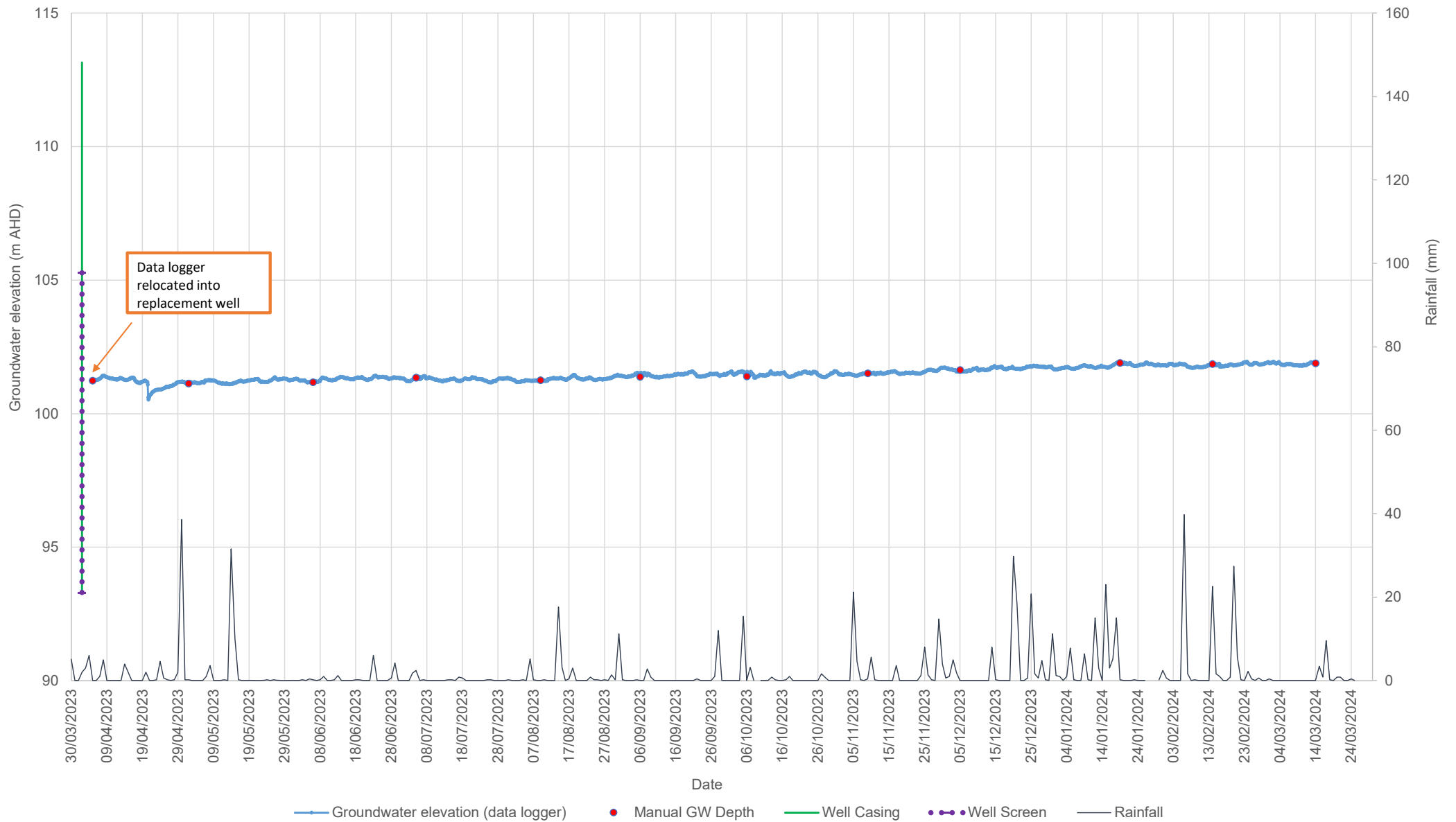
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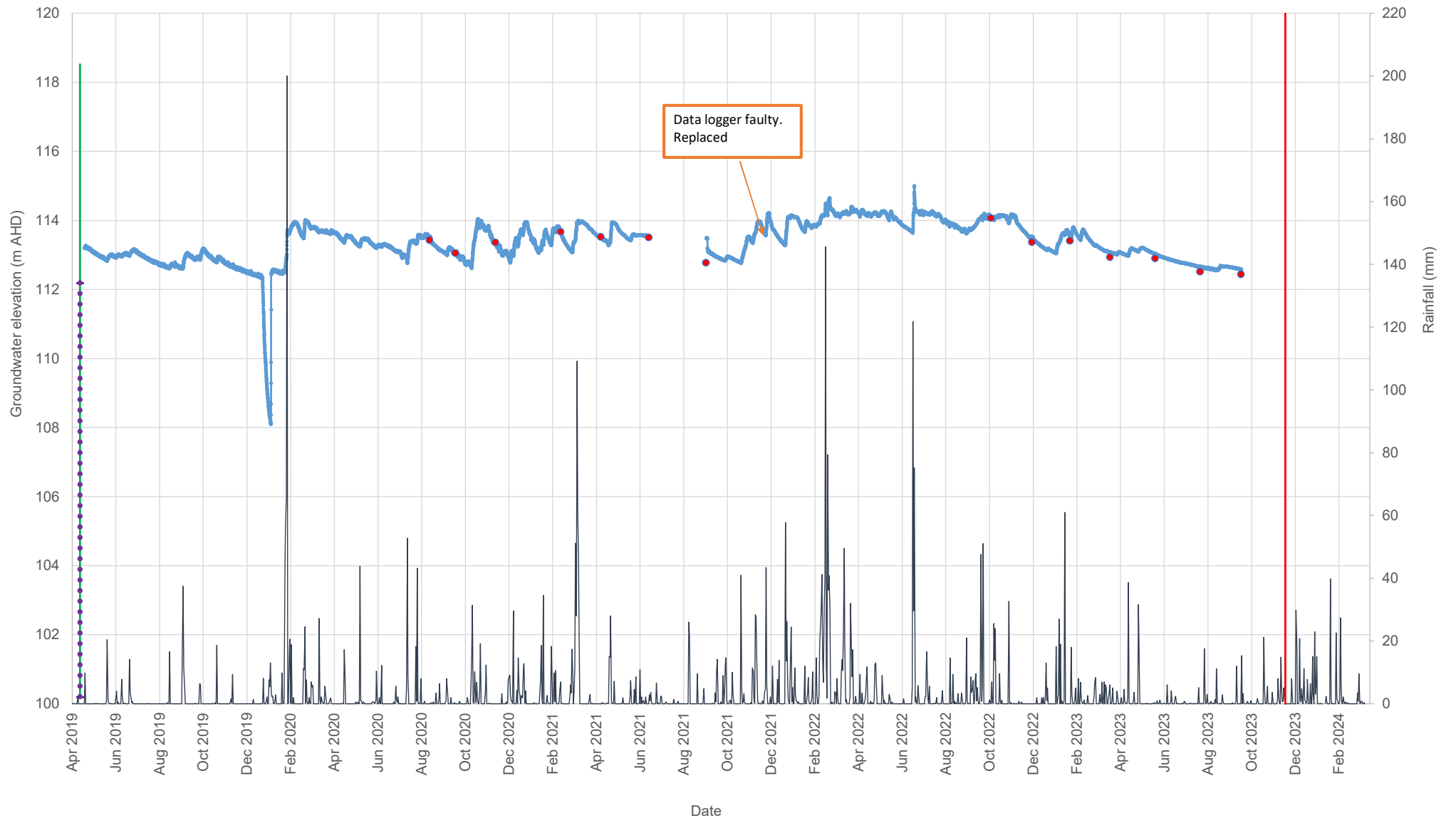
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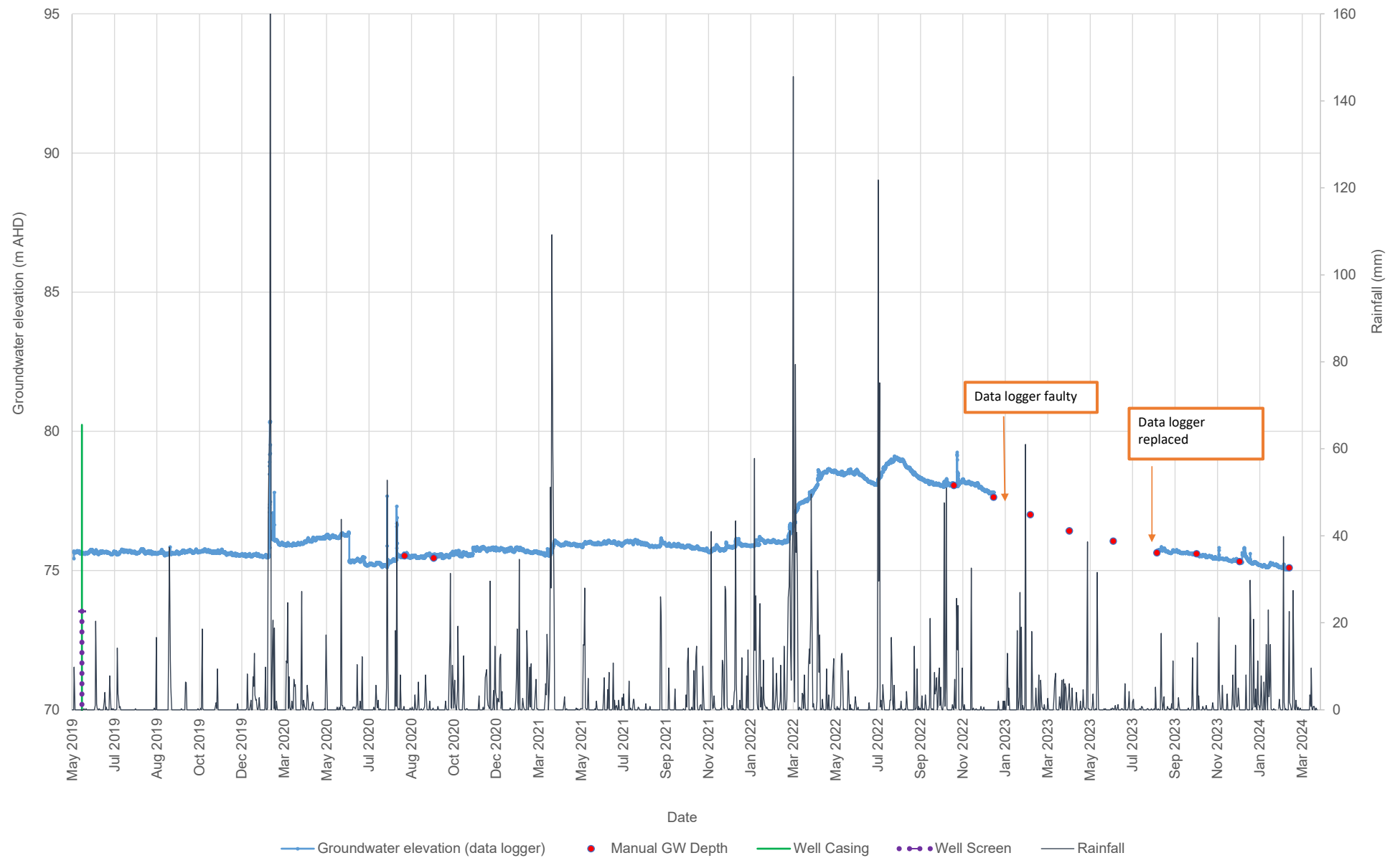
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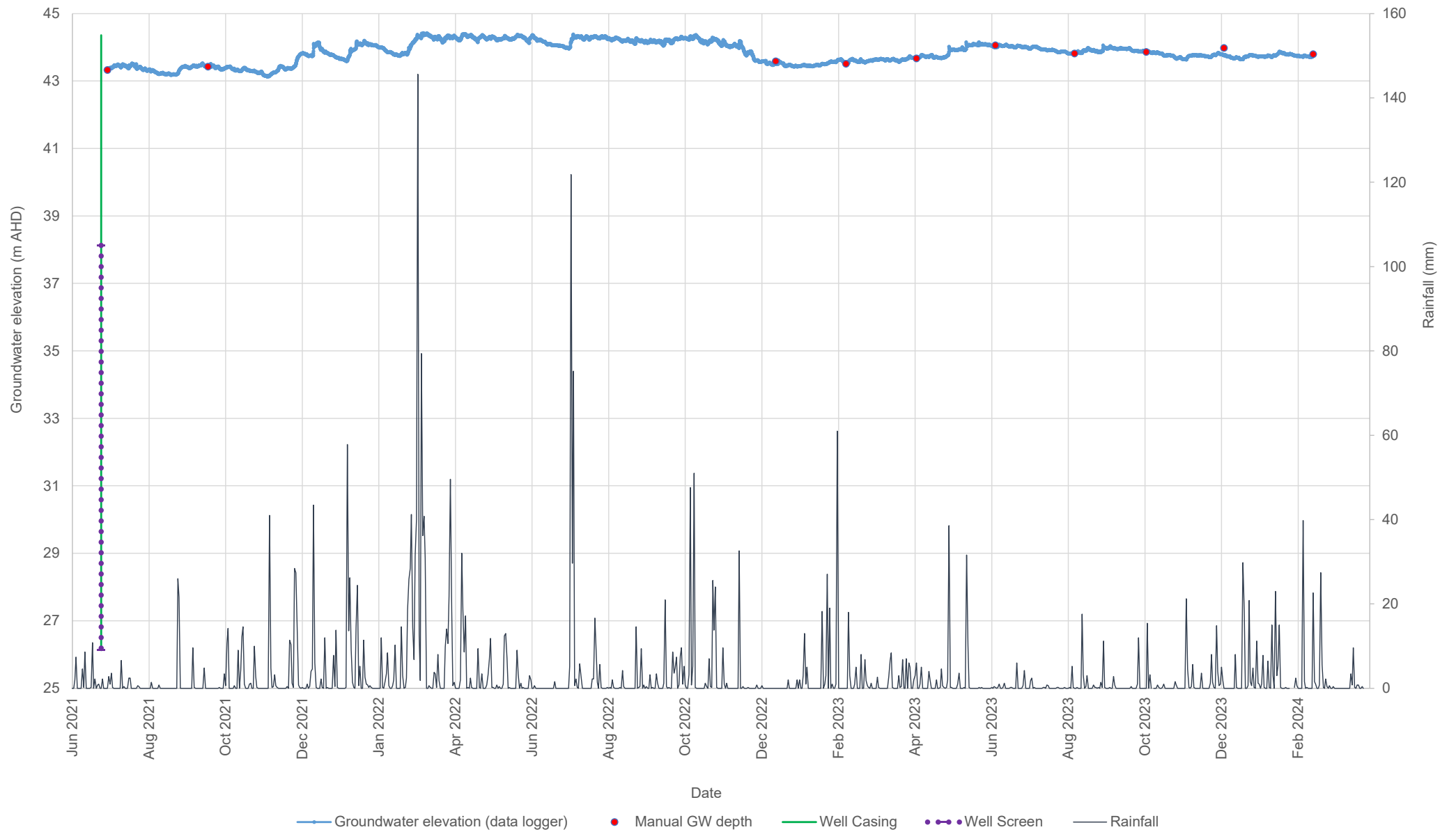
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