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HYDRO ALUMINIUM SMELTER
CAPPED WASTE STOCKPILE, 2023 ANNUAL GROUNDWATER MONITORING REPORT

RAMBOLL Bright ideas. Sustainable change.

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Prepared by	**Jake Bourke**
Checked by	**Kirsty Greenfield (CEnvP Site Contamination Specialist No. SC40104)**
Approved by	**Fiona Robinson (CEnvP Site Contamination Specialist No. SC40100)**
Description	**2023 Annual Groundwater Monitoring Report for the leachate plume associated with the Capped Waste Stockpile at the former Hydro Aluminium Kurri Kurri Smelter, Loxford, NSW.**

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ABBREVIATIONS

Abbreviation	Description
AEC 1	Areas of Concern 1
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines (Water Quality)
CoC	Contaminant of Concern
Conc.	Concentration (in tables and graphs)
DQI	Data Quality Indicator
DQO	Data Quality Objective
CWS	Capped Waste Stockpile
EC	Electrical Conductivity
ECC	Engineered Containment Cell
EPA	Environmental Protection Authority
GME	Groundwater Monitoring Event
Hydro	Hydro Aluminium Kurri Kurri Pty Ltd
ha	hectare
km	kilometre
L	litre
LOR	Limit of Reporting
m	metre
m bgs	Metres below ground surface
µg/L	micrograms per litre
mg/L	milligrams per litre
NATA	National Association of Testing Authorities
NSW	New South Wales
No.	Number of samples (in tables and graphs)
pH	Measure of acidity, hydrogen ion activity
Ramboll	Ramboll Australia Pty Ltd
RPD	Relative Percentage Difference
QA/QC	quality assurance/quality control

EXECUTIVE SUMMARY

Ramboll has completed quarterly monitoring of a leachate plume at the former Hydro Aluminium Kurri Kurri Smelter since July 2013. The source of the leachate plume was a stockpile of aluminium smelter waste known as the Capped Waste Stockpile (CWS). The CWS was remediated via source removal and waste transfer to a newly constructed Engineered Containment Cell (ECC) between May and November 2023 as part of the ECC Construction and Site Remediation Project.

Forty-one GMEs have been completed within the leachate plume, with this Annual Report documenting the four most recent events completed in March, June, September, and November 2023.

Each GME included the sampling and analysis of groundwater from a network of 24 shallow and deep wells located on five sections along the length of the leachate plume down-gradient of the CWS. An additional pair of two shallow and deep wells were added to the network in 2016. These wells are located adjacent to Swamp Creek, the nearest surface water receptor. Physico-chemical parameters were recorded, and groundwater samples were collected and analysed for soluble fluoride, total and free cyanide as well as total and dissolved aluminium.

Evaluation of 2023 GME data has identified the following:

- Consistent with previous monitoring:
    - The leachate plume in shallow groundwater is delineated to the north, with a decreasing trend in soluble fluoride concentrations in well N9 at the leading edge of the plume.
    - The leachate plume is confined to the east due to geological constraints (high plasticity clay with low permeability). There is an increasing trend in pH and soluble fluoride in well E4 located on the eastern plume perimeter however this is not indicative of contaminant migration in this direction due to the aquifer extent.
    - The leachate plume has impacted the deeper sand aquifer in a localised area close to the plume source, the CWS, as shown by elevated soluble fluoride concentrations and a high pH in well W2D.
    - The leachate plume is not reaching the nearest surface water receptor of Swamp Creek, as indicated by continued low pH and low soluble fluoride concentrations in sentinel wells.
- There may be some expansion of leachate impact in the deep aquifer to the east, from the source towards W1D, with an increasing trend identified for both pH and soluble fluoride concentrations for three consecutive years (2021 to 2023). pH values at W1D are approaching levels characteristic of leachate impact (pH >9).
- Following CWS removal (source) it is anticipated that concentrations of contaminants will reduce with time. In the absence of risks to human health and terrestrial and aquifer ecology as reported in Environ (2013) and the proposed commercial/industrial land use, no further remediation is proposed.

This Annual Groundwater Monitoring Report is currently prepared to comply with Special Condition E1 in Hydro's Environmental Protection License (EPL) 1548, which indicates:

E1 Groundwater interception and monitoring – Capped Waste Stockpile

E1.1 The licensee is to continue operating the groundwater interception trench and leachate management system for the Capped Waste Stockpile

E1.2 the licensee is to continue the groundwater monitoring program in accordance with the 'Groundwater Water Monitoring Program, Capped Waste Stockpile' plan as provided to the EPA on 15 April 2024

E1.3 The licensee must submit a groundwater monitoring report to the EPA with each Annual Return. This report must include, but need not be limited to:

a) Aquifer characterisation, including aquifer behaviour
b) A trend analysis of monitored parameters in key wells, and
c) Any recommendations arising from a review of groundwater data

As the CWS was remediated in 2023, post-remediation monitoring will commence in 2024 as per Ramboll (2018) Remedial Action Plan, Hydro Aluminium Smelter Kurri Kurri. Post-remediation monitoring will include bi-monthly groundwater monitoring events commencing in February 2024. Trend analysis will be completed by utilising 2022 and 2023 data in conjunction with post-remediation data. A post-remediation monitoring report is to be prepared once stable or decreasing trends are achieved.

Ramboll recommend that the Special Conditions in Hydro's EPL be updated to reflect the current status of the CWS (remediation complete) and that post-remediation monitoring has commenced, as follows:

- Remove Special Condition E1.1 based on the recommendations in **Section 3.4**
- Update Special Condition E1.2 to reflect that Hydro has moved to post-remediation monitoring on a bi-monthly basis for 2024 and 2025 following source removal of the CWS, as per Ramboll (2018) Remedial Action Plan, Hydro Aluminium Smelter Kurri Kurri
- Update Special Condition E1.3 to indicate that Leachate Plume Validation Report should be submitted to the EPA at the completion of post-remediation monitoring to close out remediation of the CWS and associated leachate plume.

1. INTRODUCTION

Ramboll Australia Pty Ltd (Ramboll) was commissioned by Hydro Aluminium Kurri Kurri Pty Ltd (Hydro) to undertake quarterly Groundwater Monitoring Events (GMEs) on a portion of the former Hydro Aluminium Kurri Kurri Smelter, located off Hart Road, Loxford, New South Wales (NSW), Australia.

The portion of the former Smelter subject to the quarterly groundwater monitoring comprises the former smelter waste storage area known as the 'Capped Waste Stockpile' (CWS) and an associated area of leachate impacted groundwater (the leachate plume). The CWS and associated leachate plume were identified as Area of Concern 1 (AEC 1) in the Phase 2 Environmental Site Assessment completed by Environ (now Ramboll) in 2012. The location of the CWS is shown in **Figure 1, Appendix 1**.

Ramboll has completed 10 years of GMEs during remediation planning, receipt of approvals for and construction of an on-site Engineered Containment Cell (ECC) for long-term secure storage of aluminium smelter waste and contaminated soil. Results of previous GMEs completed between July 2013 and December 2022 have been reported in the following reports:

- 'Hydro Aluminium Kurri Kurri Smelter, Capped Waste Stockpile, 12 Month Groundwater Monitoring Report', by Environ (now Ramboll), dated February 2015
- 'Hydro Aluminium Smelter, Capped Waste Stockpile, 2015 Annual Groundwater Monitoring Report' by Ramboll Environ (now Ramboll), dated April 2016
- 'Hydro Aluminium Smelter, Capped Waste Stockpile, 2016-2017 Annual Groundwater Monitoring Report', by Ramboll, dated February 2018
- 'Hydro Aluminium Kurri Kurri Smelter, Capped Waste Stockpile, 2018 Annual Groundwater Monitoring Report', by Ramboll, dated February 2019
- 'Hydro Aluminium Kurri Kurri Smelter, Capped Waste Stockpile, 2019 Annual Groundwater Monitoring Report', by Ramboll, dated February 2020
- 'Hydro Aluminium Kurri Kurri Smelter, Capped Waste Stockpile, 2020 Annual Groundwater Monitoring Report', by Ramboll, dated February 2021
- 'Hydro Aluminium Kurri Kurri Smelter, Capped Waste Stockpile, 2021 Annual Groundwater Monitoring Report', by Ramboll, dated February 2022
- 'Hydro Aluminium Kurri Kurri Smelter, Capped Waste Stockpile, 2022 Annual Groundwater Monitoring Report', by Ramboll, dated February 2023

This report presents the results of four quarterly GMEs, completed in March, June, September, and December of 2023, as well as a trend analysis of the results from the 41 monitoring events completed between 2013 and 2023.

1.1 Objective and Scope of Work

The objective of each quarterly GME was to:

- Assess the current status of leachate impacts to groundwater occurring from the CWS
- Compare the current status of leachate impacts to historical data to assess changes in groundwater quality.

The objective of this 2023 Groundwater Monitoring Report is to:

- Tabulate results for depth to groundwater, physico-chemical parameters and analytical data collected in 2023.
- Complete trend analysis of monitored parameters in key wells incorporating data collected since July 2013.
- Complete trend analysis with rainfall data.
- Contour contaminant concentrations in the shallow and deep aquifers.
- Assess the impact of the leachate interception trench on groundwater quality.

- Assess plume migration.
- Provide conclusions and recommendations.

The scope of work for each quarterly GME included:

- Gauging, purging, and sampling of 28 groundwater monitoring wells on five sections through the plume, including two shallow wells and two deep wells located adjacent to Swamp Creek
- Measurement of groundwater physico-chemical properties during purging, including pH, temperature, electrical conductivity (EC), redox, turbidity and dissolved oxygen
- Laboratory analysis of groundwater samples for soluble fluoride, total and dissolved aluminium, and total and free cyanide

1.2 Update on ECC Construction and Site Remediation Project

The ECC Construction and Site Remediation Project includes the following works:

- Construction of the ECC base and lining works
- Material transfer of process waste and contaminated material in interim stockpiles at the Smelter Site to the ECC
- Material transfer of contaminated soil from remaining AECs that require remediation as per Ramboll (2018) Remedial Action Plan, Hydro Aluminium Smelter Kurri Kurri
- Material transfer of contaminated material generated during Final Demolition Works
- Treatment of leachate generated during material transfer through a Temporary Water Treatment Plant (TWTP)
- Construction of ECC capping layers and perimeter access road

Remedial works commenced in 2015 and progressed through the demolition of the Smelter between 2017 and 2020. Contaminated soil that was remediated during this period were stockpiled in interim stockpiles on the Smelter Site. The ECC was constructed between 2021 and 2022. Topsoil and clay capping was removed from the CWS and stockpiled for re-use on the Smelter Site in August 2022. Waste transfer to the ECC occurred between February 2023 and November 2023 and included transfer of contaminated material in interim stockpiles and remediation of remaining AECs including the CWS. Waste transfer was completed by the Remediation Contractor. Final demolition works were also completed in 2023, with the demolition contractor placing contaminated material in interim stockpiles for transfer to the ECC by the Remediation Contractor.

During waste transfer, leachate from the CWS and leachate pumped from the two leachate sumps within the ECC was treated through a Temporary Water Treatment Plant (TWTP). The TWTP is to be decommissioned in February 2024.

Capping of the ECC commenced in December 2023 and will continue until June 2024.

1.3 Limitations

Ramboll Australia Pty Ltd (Ramboll) prepared this report in accordance with the scope of work as outlined in our proposal to Hydro Aluminium Kurri Kurri Pty Ltd dated 4 December 2020 and in accordance with our understanding and interpretation of current regulatory standards.

A representative program of sampling and laboratory analyses was undertaken as part of this investigation, based on past and present known uses of the site. While every care has been taken, concentrations of contaminants measured may not be representative of conditions between the locations sampled and investigated. We cannot therefore preclude the presence of materials that may be hazardous. Site conditions may change over time. This report is based on conditions encountered at the Site at the time of the report and Ramboll disclaims responsibility for any changes that may have occurred after this time.

The conclusions presented in this report represent Ramboll's professional judgment based on information made available during this assignment and are true and correct to the best of Ramboll's knowledge as at the date of the assessment.

Ramboll did not independently verify all the written or oral information provided to Ramboll during this investigation. While Ramboll has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided to Ramboll was itself complete and accurate.

This report does not purport to give legal advice. This advice can only be given by qualified legal advisors.

1.4 User Reliance

This report has been prepared exclusively for Hydro Aluminium Kurri Kurri Pty Ltd and may not be relied upon by any other person or entity without Ramboll's express written permission.

2. BACKGROUND

2.1 Site Background

The former Hydro Aluminium Kurri Kurri Smelter is located approximately 30 kilometres (km) west of the city of Newcastle and 150 km north of Sydney, in NSW, Australia. The former smelter included a 60-hectare (ha) plant area and a 2,000-ha buffer zone.

The CWS is a repository of waste arising during the operations of the aluminium smelter and includes spent pot lining, anodes, scrubber bags, concrete, brick, bulky waste, fines, and other smelter wastes. The CWS is located near the eastern boundary of the smelter footprint and adjacent to the surrounding Hydro owned buffer land.

The CWS was maintained as an uncapped bunded waste repository prior to being capped with clay under development consent in the mid-1990s. At this time, impacts to vegetation in the buffer zone downgradient of the CWS were observed. Leachate from the CWS, caused by rainwater and groundwater coming into contact with the CWS contents, was also known to have impacted on groundwater and investigations commenced to explore the extent of groundwater impact. These investigations identified that leachate impacted groundwater likely originated from the northeast corner of the CWS and extended approximately 250 meters (m) northeast. The CWS and associated leachate impacted groundwater were identified as AEC 1 in the Phase 2 Environmental Site Assessment completed by Environ (now Ramboll) in 2012. The location of AEC 1 is shown in **Figure 1, Appendix 1**. Ramboll assessed AEC 1 as part of the following investigations:

- 'Phase 2 Environmental Site Assessment, Kurri Kurri Aluminium Smelter', dated 1 November 2012
- 'Environmental Site Assessment, Capped Waste Stockpile, Kurri Kurri Aluminium Smelter', dated 13 December 2012
- 'Plume Delineation Report, Capped Waste Stockpile', dated 6 November 2013.

Following these investigations, a Groundwater Monitoring Programme was developed that included monitoring 24 wells on five cross sections along the length of the plume. A summary of the Plume Delineation Report was included in Section 2.2 of the 12 Month Groundwater Monitoring Report (ENVIRON June 2016) and further information regarding the development of the Program is presented in Section 2.4 of that report.

Interim mitigation measures were taken in 2013, 2016, 2017 and late 2022 to intercept the shallow movement and daylighting of leachate impacted groundwater. Measures involved the installation of passive or active shallow trenches, extending approximately 2 m below the ground surface perpendicular to the plume migration and providing pipe conveyance of the leachate impacted groundwater to the surface.

Planning approval was received for the remediation of the CWS (State Significant Development SSD 6666) in December 2020. As indicated in **Section 1.2**, remediation of the CWS was completed in 2023 and this has removed the source of leachate to the groundwater system. Following source removal, remaining leachate impacted groundwater will be monitored to confirm that remediation is occurring through natural processes following subsequent rainfall.

2.2 Characterisation of the Leachate Plume

A Conceptual Site Model (CSM) was developed following Stage 1 and Stage 2 of the investigations and was included in 12 Month Groundwater Summary Report, 2014 (Environ 2015).

The former smelter and surrounding land generally comprises flat, low lying swampy ground that is at an elevation of between 12 m Australian Height Datum (AHD) and 15 m AHD. The CWS is located within the smelter portion of the site and is approximately 170 m in length by 130 m in width and is up to 11 m high and has until recently been capped with clay and topsoil. The eastern portion of the site within the buffer zone retains natural bushland vegetation with minor surface filling using

refractory bricks along the buffer zone fence line. Two areas of vegetation impact, known as the northern and southern vegetation impact areas are located in the north-eastern portion of the site.

The CWS comprises stockpiled spent pot lining wastes and other wastes including cryolite, alumina, floor sweepings, shot blast dust, cement and pot lining mix. The waste is not leachate generating of itself (i.e., not putrescible) however, the uncapped storage of waste and subsequent infiltration of rainwater through the waste stockpile led to the generation of leachate over a period of approximately 25 years. Prior to capping, the leachate was collected behind bund walls surrounding the spent pot lining stockpile. During capping, leachate was suspected to have been entrapped within the fill in the north-eastern corner of the CWS.

The CWS was capped in 1995 to prevent further infiltration. The suspected burial of leachate during capping and the ongoing contact between waste material and shallow groundwater beneath the CWS is considered to result in the ongoing leachate generation.

Major contaminants in the leachate are sodium (4,800 mg/L to 15,300 mg/L), fluoride (1,100 mg/L to 3,420 mg/L), sulphate (4,000 mg/L to 6,740 mg/L) and cyanide (70 mg/L to 200 mg/L) based on data obtained from leachate ponded within the bunded area of the CWS prior to capping (Reference: Dames & Moore (1992) 'Environmental Impact Statement, Upgrades to Waste Storage Facilities at the Alcan Australia Limited Kurri Kurri Smelter'). Leachate impacted groundwater is observed to be brown in colour.

The leachate plume originates from beneath the eastern side of the CWS where seepage into shallow groundwater within a semi-continuous sand aquifer has occurred. The shallow sand aquifer has been delineated as an elongate and sinuous sand lens approximately 50 m wide and 250 m in length extending to the northeast of the CWS. The shallow sand aquifer is surrounded vertically and horizontally by a discontinuous clay aquitard that has been less impacted by leachate in close proximity to the plume and not been impacted by leachate at a distance from the plume. The configuration of the aquifer is a result of the nature of the deposition of sediments within a former estuary during periods of sea level rise and fall. A schematic cross section of the site is included as **Attachment 1**, **Appendix 2**.

The location of the plume within the semi-continuous shallow sand aquifer constrained by the surrounding discontinuous clay aquitard suggests that the movement of the leachate groundwater plume is limited by the geology. The complex interbedded Quaternary sediments comprise estuarine muds (high plasticity clay), fluvial channel sands (fine grained and coarse-grained sands), sandy levee deposits (clayey sand/sandy clay) and high energy flood deposits (coarse grained quartz sand).

Delineation investigations show that the groundwater plume remains confined within one main sand filled channel which directs flow to the northeast. This finding is consistent with observations of a heavily vegetated area evident in the 1961 historical aerial photograph (**Attachment 2**, **Appendix 2**). The heavy vegetation reflects surface and subsurface drainage lines and likely represents the shallow groundwater table present in the sand filled channel. The 1961 aerial photograph depicts the vegetation extending further to the northeast and connecting with Swamp Creek. Given the correlation between the plume extent and the vegetation, it is reasonable to conclude that the groundwater flow path will continue along the vegetation alignment toward Swamp Creek and that, should the plume migration reach the surface water receptor, the discharge point will occur approximately 750 m to 1,000 m north-east of the plume, as shown in **Attachment 2**, **Appendix 2**. Fate and transport modelling to predict the migration of the plume along this channel has been undertaken, as summarised in **Section 2.5**.

The shallow nature of the semi-continuous sand aquifer results in the exfiltration of leachate impacted groundwater within topographically low areas of the site and following high rainfall events. The impacts of exfiltration are observed on the eastern edge of the plume where dieback of vegetation has occurred (southern and northern vegetation impact areas). Brown coloured seepage is observed and evaporation of exfiltrated groundwater has left a white salt crust on surface soils in

this area. The high electrical conductivity of the exfiltrated groundwater (up to 15,000 µs/cm) exceeds the limit (12,200 µs/cm) at which conditions are generally too saline for plant growth (ANZECC, 2000).

The semi-continuous shallow sand aquifer that is impacted with leachate is characterised by high pH (pH >9), electrical conductivity (>5,000 µS/cm), fluoride (>200 mg/L) and total cyanide (>6 mg/L) concentrations and is brown in colour. Historical data from 1992 to 2014 indicates fluoride concentrations within the leachate plume decreased after the CWS was capped in 1995. Fluoride concentrations near the CWS, the source of the plume, peaked in 1997. Mid-way along the plume, fluoride concentrations peaked around 2000 and at the leading edge, fluoride concentrations peaked between 2004 and 2006, as shown in **Figure 2-1**.

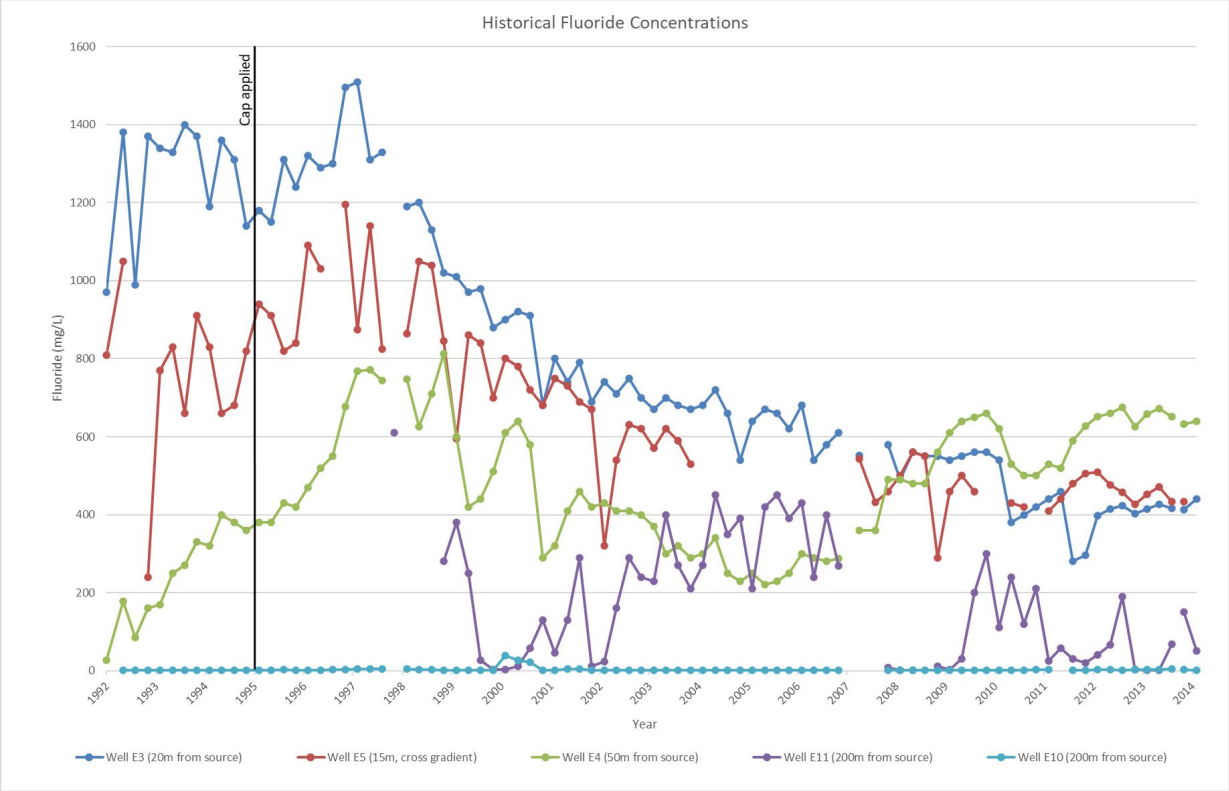

Figure 2-1: Historical Fluoride Concentrations Along the Plume 1992 - 2014

Ex-filtrated leachate impacted groundwater is observed to become overland flow discharging along a surface water flow path to a small dam. During periods of high rainfall, surface water within this dam can flow through a culvert structure to a larger dam which discharges to Swamp Creek. The overland flow path is shown in **Attachment 3**, **Appendix 2**.

Fluoride concentrations at the semi-permanent dam, located between the leachate impacted groundwater plume and Swamp Creek, typically vary between 15 mg/L and 25 mg/L. It is considered that the elevated fluoride concentrations in the semi-permanent dam are due to overland flow of exfiltrated groundwater from their source at the southern and northern vegetation impact areas. Sampling found the fluoride concentrations in Swamp Creek vary between 0.49 mg/L upstream of the smelter and 1.2 mg/L downstream. Adjacent to the semi-permanent dam discharge to Swamp Creek, fluoride concentrations were 1.6 mg/L. The Stage 2 Aquatic Assessment - Ecological Risk Assessment completed by ENVIRON in June 2013 indicated there is no discernible impact to the aquatic ecology within the semi-permanent dam due to elevated concentrations of fluoride in surface water and sediment.

2.3 Aquifer Characterisation

A sand aquifer within the buffer zone of the former smelter has been impacted by leachate from the CWS. An underlying deep aquifer has also been impacted near the contamination source. The characteristics of this sand aquifer and the underlying deep aquifer are critical to the understanding of the site CSM. Aquifer characteristics have been identified as outlined in **Table 2-1**.

Table 2-1: Aquifer Characteristics

Characteristic	Comment
Aquifer Type	Unconsolidated sediment (estuarine)
Aquifer Depth	Shallow: Approximately 0.3 metres below ground surface (m bgs) to 2.5 m bgs Deep: Approximately 3.5 m bgs to 7 m bgs
Confined/Unconfined	Shallow: Unconfined Deep: Confined by high plasticity clays in some areas
Groundwater Flow Direction	Shallow: North to northeast Deep: Northeast
Recharge Mechanism	Shallow: Infiltration Deep: Infiltration
Porosity	Shallow: Variable due to variable nature of the sediments. High porosity quartz gravels identified at northeast corner of the Capped Waste Stockpile. Mid to low porosity tightly packed sands identified along plume length. Deep: Mid to low porosity poorly sorted, tightly packed fine-grained sand.

The most important characteristic for the movement of leachate through the shallow aquifer is the nature of the materials, particularly the complex and variable nature of the unconsolidated sediments. The nature of the sediments impacts the soil permeability, with high porosity quartz gravels, mid to low porosity tightly packed sands and high plasticity clays with very low porosity, all identified within the unconsolidated estuarine sediments. The leachate from the CWS permeates through mid to high porosity sediments but is retarded by high plasticity clays. Where low porosity and low permeability conditions constrain sub-surface flow, groundwater may discharge at the ground surface coinciding with changes in topography.

2.4 Fate and Transport Modelling

ENVIRON (February 2015) conducted a hydrogeological review and analytical groundwater contaminant transport modelling to assess the fate and transport of the leachate plume within the shallow aquifer. The assessment and modelling included a review of site investigation data and the construction of a conceptual hydrogeological model of AEC 1 CWS and its surrounds.

A one-dimensional model (UK EA Remedial Targets Worksheet) was used to simulate the groundwater flow and contaminant transport conditions to predict contaminant (fluoride) concentrations from the source to the nearest down-gradient receptor (Swamp Creek).

The model was calibrated against observed fluoride concentrations from the existing groundwater monitoring well network to the east and north-east of the capped waste stockpile. The groundwater fluoride concentration at the receptor impact point was then evaluated under the simulated model and compared with the guideline criteria.

The following conclusions were drawn from the results of the modelling:

- Based on the existing hydrogeological conditions and the presence of an ongoing source from the CWS, the model estimated a fluoride concentration of 4.3 mg/L at the receptor distance (1,000 m), compared to the guideline criteria of 1.5 mg/L

- This value is considered a conservative estimate given the model assumes a continuous source, however, historical, more recent, and proposed works are considered to have mitigated the source contribution. Future remedial works are proposed to ultimately remove the source (spent Pot Liner, anodes, scrubber bags, concrete, brick, bulky waste, fines, and other smelter wastes stockpiled within the CWS)
- The model demonstrates sensitivity to a few input parameters including the soil partition coefficient, (Kd). Future studies may include site specific determination of the soil partition coefficient to improve model calibration.

3. LEACHATE MANAGEMENT SYSTEM

Hydro has implemented a leachate management system to remove leachate in shallow groundwater that has the potential to daylight and flow over overland flow paths during periods of high rainfall.

The leachate management system includes a network of strategically placed leachate interception trenches, as follows:

- Toe of CWS: active leachate interception trench
- Southern vegetation impact area: passive leachate interception trench
- Northern vegetation impact area: passive leachate interception trench

The leachate management system was installed as an interim remedial measure and has been in place since 2013. Following remediation of the CWS, the source of leachate, in 2023, an evaluation of the leachate management system is included below.

3.1 Leachate Interception Trench at Toe of CWS

The leachate interception trench at the toe of the CWS extends along a small section of land between the access track off Dickson Road and the eastern toe of the CWS from approximately halfway along the CWS. This leachate interception trench was placed at the location where leachate-impacted groundwater was identified to be leaving the CWS. The location of the interception trenches is shown in **Attachment 4**, **Appendix 2.**

The active interception trench was constructed in 2014 using a 100 mm slotted PVC pipe placed in the ground at a depth of approximately 2 m below ground surface (bgs). The northern end of the pipe was connected to a pump to actively pump leachate to the East Surge Pond for discharge via the North East Dam to an Irrigation Area, where water from the North East Dam is spray-irrigated. A conceptual cross section of the active interception trench on Section 1 is included in **Attachment 5**, **Appendix 2**.

The active interception trench was in operation from May 2014 to March 2016 when the discharge rate dropped to 0 L/ minute. Operation of the active trench since March 2016 has not been required as leachate is no longer collecting in the trench.

In late 2022, the active interception trench was removed and replaced with two interception trenches targeting leachate in the shallow and deep aquifers. One horizontal trench extends approximately 40 m, with a slope to the south and a connection to a vertical pumping bore located near well W7S. A second pumping bore was installed adjacent to the deep well W2D, which is impacted with leachate.

The two new leachate interception trenches pumped water into a holding tank near the East Surge Pond. A total of 39,000 L of water was pumped into the holding tank between February and March 2023 during a period of higher rainfall. Minimal water has been pumped to the holding tank since March 2023. Water in the holding tank was sampled in August 2023, with a fluoride concentration of 12.4 mg/L indicating the majority of the water was stormwater.

During remediation of the CWS in 2023, leachate entrained within the footprint of the CWS was removed as follows:

- Leachate within waste was mixed with drier material and transferred with waste via truck to the ECC
- Leachate within sand lenses located above clay at the western end and south-eastern corner of the CWS was excavated and relocated to the ECC
- Leachate within deeper sand known to extend to a depth of at least 6 m bgs could not be practicably removed via excavation of sand, this leachate was pumped from a sump excavated into the north-east corner of the CWS and either relocated to the ECC in Intermediate Bulk Containers (IBCs) or pumped to Leachate Dam LD03 for treatment through the TWTP

Leachate within the CWS footprint was removed to the extent practicable. Following leachate removal from within the CWS footprint, the majority of the shallow wells that intersect leachate impacted groundwater have been dry.

3.2 Leachate Interception Trench at Southern Vegetation Impact Area

In early 2013, a short passive leachate interception trench was installed north of Section 2 to intercept leachate prior to daylighting to surface near the southern vegetation impact area. This passive trench drains leachate into an above-ground tank that is required to be emptied manually. The location of the interception trench at the southern vegetation impact area is shown in **Attachment 4**, **Appendix 2.**

Emptying of this tank has been completed on an ad-hoc basis and volume of leachate captured has been insufficient to record.

A site visit following completion of remedial works at the CWS in January 2024 shows that native grasses have re-colonised the southern vegetation impact area, as shown below. The first photograph, taken in 2013 during plume delineation works, shows overland flow of leachate and non-native grasses. The second photo, taken in January 2024, shows the current status of the southern vegetation impact area, with no evidence of overland flow of leachate and native grasses have replaced non-native grasses.

Figure 3-1: Southern vegetation impact area in 2013

Figure 3-2: Southern vegetation impact area in 2024

3.3 Leachate Interception Trench at Northern Vegetation Impact Area

A second passive interception trench was installed north of Section 4 in October 2017 to capture leachate daylighting along the western edge of the northern vegetation impact area. This interception trench was upgraded in November 2022 to replaced sandy material used as backfill over the trench with clay to prevent infiltration of surface water. The location of the interception trench at the northern vegetation impact area is shown in **Attachment 4**, **Appendix 2.**

Hydro has maintained records of the volume of water pumped from this trench to the East Surge Pond since June 2018. The cumulative total of water pumped from this trench is 549,000 L. Since the clay plug was installed in November 2022, the total volume of water has dropped from an average of 107,600 L per year between 2018 and 2022 to a total of 11,000 L in 2023.

Overland flow of leachate through the northern vegetation impact area has not been observed in 2023, likely due to the progressive removal of leachate entrained within waste in the footprint of the CWS and due to low rainfall in 2023.

Water samples from the holding tank were collected for analysis in August 2023 and January 2024. Fluoride concentrations dropped from 75 mg/L in August 2023 to 61.4 mg/L in January 2024.

Arial photographs from NearMaps© show the improvement in vegetation in both the northern and southern vegetation impact areas, as shown in **Figure 3-3** and **Figure 3-4**.

Figure 3-3: Vegetation impact areas in 2010

Figure 3-4: Vegetation impact areas in 2023

3.4 Recommendations for Leachate Management System

Based on source removal of entrained leachate within the CWS in 2023, the improvement in vegetation in the two vegetation impact areas, the lack of overland flow of leachate and the relatively low concentrations of fluoride in water collected in the holding tanks, the following recommendations are made for the leachate management system:

- The leachate interception trench at the toe of the CWS is no longer required
- The leachate interception trench at the southern vegetation impact area is no longer required
- The leachate interception trench at the northern vegetation impact area can remain in place and the water level in the tank can be monitored throughout 2024 as it is anticipated that the volume of water that will be captured will be less than 10,000 L, which is the size of the tank

Water collected in the tank at the northern vegetation impact area can continue to be managed by being pumped to the East Surge Pond.

4. SAMPLING AND ANALYSIS QUALITY PLAN

4.1 Objective

The objective of each quarterly GME is to collect water quality data from the groundwater monitoring network to inform the behaviour of the leachate plume over time and provide data for annual reporting.

The groundwater monitoring network comprises groundwater wells located on five sections along the length of the leachate plume, as follows:

- Section 1: Wells E5, E5D, W7S, W7M, ~~PUMP~~[1], W2S, W2D
- Section 2: Wells E5, E5D, E4, W1S, W1D
- Section 3: Wells A7, W3S, W4S
- Section 4: Wells E11, W5S, W5D, N2
- Section 5: Wells G2, N8, N9, W6S, W6D

Two pairs of shallow and deep wells adjacent to Swamp Creek (F5/G5 and F6/G6) were added to the groundwater monitoring network in 2016. These are sentinel wells that are unimpacted by leachate. The presence of leachate in these wells would indicate potential impact to Swamp Creek, the nearest surface water receptor. The groundwater monitoring network is shown in **Figure 2, Appendix 1**.

4.2 Scope of Works

The scope of works included the following:

- The collection of groundwater samples and measurement of water levels and physico-chemical parameters (including pH, temperature, EC, redox, turbidity and dissolved oxygen) from 28 groundwater wells in the groundwater monitoring network
- Laboratory analysis of groundwater samples for soluble fluoride, total and dissolved aluminium, and total and free cyanide. Dissolved aluminium was included as part of laboratory analysis from June 2018.

4.3 Fieldwork Methodology

The fieldwork methodology for the collection of groundwater samples is outlined in **Table 3-1**.

Table 3-1: Field Methodology for Quarterly Groundwater Monitoring

Activity	Details
Well Gauging	Monitoring wells were gauged using a water level meter which was calibrated prior to use.
Well Purging	Monitoring wells were purged prior to sampling by pumping water from the wells until the physico-chemical parameters stabilised.
Decontamination	The majority of the sampling equipment used during low flow sampling was dedicated and disposable, such as the dedicated and disposable sampling tube. Non-disposable sampling equipment, including the interface probe, water quality meter and flexible pump tubing was decontaminated by washing in a Decon®90 solution and rinsing with potable water between sampling locations.
Sample Collection and Storage	Groundwater samples were collected into laboratory-supplied bottles with the appropriate preservative for the analysis undertaken. The bottles were stored in an ice-filled cooler in the field and in transit to the laboratory.
Chain of Custody	Groundwater samples were dispatched to the laboratory under chain of custody conditions.

4.4 Data Quality Objectives

Data quality objectives (DQOs) are outlined in **Table 3-2**.

[1] This well was destroyed during reinstallation of the interception trench and has not been replaced.

Table 3-2: Data Quality Objectives

DQO	Outcome
State the Purpose	To collect on-going monitoring data from a network of wells to understand the temporal and spatial behaviour of the aquifer around leachate impacted groundwater.
Identify the Decision	• Is the data collected from the monitoring well network of sufficient quality to meet the project objectives? • Is the data collected from the monitoring well network of sufficient quality to be comparable between events?
Identify Inputs to the Decision	• Record physico-chemical parameters and collect samples from the groundwater monitoring well network (see **Figure 2, Appendix 1**) over four quarterly GMEs. • Complete analysis of collected groundwater samples for soluble fluoride, total and free cyanide, total and dissolved aluminium; and • Analyse the data and compare with historical results.
Define the Study Boundaries	AEC 1 identified in **Figure 1**, **Appendix 1** plus the surface water receptors identified down gradient of AEC 1, including a semi-permanent dam and Swamp Creek. The investigation relates to groundwater.
Develop a Decision Rule	The statistical parameters of interest are the concentrations of fluoride, cyanide, aluminium, pH and EC identified historically and in the current investigations. The Assessment Criteria outlined in **Section 5** and the historical groundwater concentrations where available for the monitoring wells. The Decision Rules for groundwater are: • Groundwater concentrations were assessed against the acceptance criteria outlined in **Section 5** in combination with a comparison against background criteria where applicable. An evaluation of significance was also undertaken; and • Recommendations were made for further evaluation for concentrations above criteria or background concentrations.
Specify Limits on Decision Errors	As this investigation involves a series of GMEs to monitor the state of a groundwater leachate plume, decision errors relate to the comparability of data between monitoring events. During the 2023 GMEs, 28 wells will be sampled unless found to be dry. This number takes into consideration three damaged wells (W3SA, W4D and W3D). Standard operating procedures, including consistent use of low flow techniques, should be implemented to ensure comparability of data between events. The same primary and secondary laboratories should be used for analysis and laboratory QA/QC should be assessed to ensure comparability between events.
Optimise the Design for Obtaining Data	Low flow sampling techniques will be used to collect groundwater samples to optimise the quality of the samples. Field samples for each round will be collected using the same sampling procedures to ensure comparability between GMEs.

4.5 Data Quality Indicators

Project data quality indicators (DQI) have been established to set acceptance limits on field and laboratory data collected as part of the quarterly groundwater monitoring program. The data quality indicators are outlined in **Table 3-3.**

Table 3-3: Data Quality Indicators

DQI	Field	Laboratory
Completeness – a measure of the amount of useable data from a data collection activity	All critical locations sampled. All samples collected, aside from dry wells. Experienced sampler. Documentation correct.	All critical samples analysed. All analysis completed according to standard operating procedures. Appropriate methods Appropriate Practical Quantitation Limits (PQLs).
Comparability – the confidence that data may be considered equivalent for each sampling and analytical event	Experienced sampler. Climatic conditions appropriate for the type of analyte. Climatic conditions noted during sampling. Same types of samples collected using same sampling methods.	Same analytical methods used. Same sample PQLs. Same NATA accredited laboratories used. Same units.
Representativeness – the confidence that data are representative of each medium present on site.	Appropriate media sampled. Groundwater sampled following stabilisation of physico-chemical parameters	All samples analysed according to standard operating procedures.
Precision – a quantitative measure of the variability of the data.	Collection of intra-laboratory duplicates at a rate of 1 in 10 primary samples. Collection of inter-laboratory duplicate samples at a rate of 1 in 20 primary samples.	Analysis of field duplicate samples, relative percent difference (RPDs) to be less than 30%. Laboratory duplicates analysed, RPDs to be less than 30%.
Accuracy – a quantitative measure of the closeness of the reported data to the "true" value.	Sampling methodologies appropriate and complied with. Collection of rinsate samples from non-disposable sampling equipment.	Analysis of: • Rinsate blanks • Method blanks • Matrix spikes • Surrogate spikes • Laboratory control samples • Reagent blanks. • Results for blank samples to be non-detect. • Results for spike samples to be between 70% and 130%.

5. QUALITY ASSURANCE / QUALITY CONTROL

Four quarterly GMEs were completed in March 2023, June 2023, September 2023, and December 2023. A quality assurance/quality control assessment is provided in **Table 4-1** and **Table 4-2**.

Table 4-1: QA/QC Sampling and Analysis Methodology Assessment

Sampling Methodology	Ramboll Assessment
Sampling Pattern and Locations	Prior to the commencement of the GMEs, the leachate plume originating from the CWS was delineated through staged fieldwork and reporting in ENVIRON (2013, revised 2016) 'Plume Delineation Report, Capped Waste Stockpile'. From the delineation work, 19 new groundwater wells were installed along the length of the plume to assist with groundwater monitoring. The five sections are approximately 60 m apart and extend from the toe of the CWS to the leading edge of the leachate plume. Groundwater wells target both the shallow and deep aquifer. Groundwater wells located on five sections were selected for the 2023 GMEs. Each section provides a cross section at different lengths along the known location of the leachate plume. One of the wells, W3SA, was destroyed in the April 2015 storm and has not been replaced. Another well, W4D, was also damaged in this storm but was able to be sampled until the October 2016 GME. This well can no longer be sampled and has not been replaced. A third well, W3D, has been unable to be sampled since December 2020 due to an obstruction within the well casing and is suspected to be damaged. This well has also not been replaced. A fourth well, PUMP, was destroyed during reinstallation of the interception trench in early 2023 and has not been replaced. In 2016, an additional two shallow and deep pairs of wells (F5/G5 and G6/F6) were added to the monitoring network. These wells are sentinel wells located adjacent to Swamp Creek, the nearest surface water receptor.
Sampling Density	Twenty-eight groundwater wells were selected for sampling for the 2023 quarterly GMEs on five sections along the length of the leachate plume and adjacent to the nearest surface water receptor. As the leachate plume is approximately 300 m in length, there is one section per 60 m. One primary groundwater sample was collected from each well (unless dry or damaged).
Sample Depths	Both shallow groundwater (the leachate plume) and the deep aquifer were sampled as part of the 2023 quarterly GMEs.
Sample Collection Method	For the 2023 quarterly GMEs, groundwater samples were collected using low flow methods (peristaltic pump and dedicated LDPE tubing). Groundwater samples were collected directly into laboratory-supplied bottles with field filtration for dissolved aluminium (0.45 µm). Disposable gloves were worn during sample collection.
Decontamination Procedures	Dedicated disposable tubing was used to collect the groundwater samples. A short piece of silicone tubing was retained in the peristaltic pump and used for all wells. This tubing along with all non-disposable sampling equipment (i.e., interface probe, water quality meter) was decontaminated between sampling locations by washing with a solution of Decon®90 and potable water.
Sample Handling and Containers	Samples were placed into laboratory supplied sampling containers, dosed with the correct preservative (where relevant), and immediately placed into a cooler chilled with ice and/or ice bricks while in the field and during transportation to the laboratory.
Detailed Description of Field Screening Protocols	A water quality meter was used to collect field data, including temperature, pH, electrical conductivity, reduction/oxidation potential, turbidity, dissolved oxygen, and total dissolved solids (TDS). These parameters were recorded during purging until they stabilised.

Chain of Custody	Samples were transported to the laboratory under chain of custody conditions. The chain of custody forms was signed by the laboratory on receipt of the samples.

Table 4-2: QA/Q Assessment

Data Quality Indicator	Ramboll Comments
Field Quality Control Samples	In general, intra-laboratory duplicate samples were analysed at a rate of approximately 9% and inter-laboratory duplicate samples were analysed at a rate of approximately 6% during the 2023 GMEs. At least one rinsate sample was collected per GME, except for November 2023. A summary of the field quality control samples collected during the 2023 GMEs is outlined below: • March 2023: two intra-laboratory duplicates (D01_20230323, D02_20230324), one inter-laboratory duplicate (T01_20230323) and one rinsate (R01_20230324) • June 2023: two intra-laboratory duplicates (D01_20230622, D02_20230622), one inter-laboratory duplicate (T01_20230622) and one rinsate (R01_20230623) • September 2023: one intra-laboratory duplicate (D01_20230922), one inter-laboratory duplicate (T01_20230922) and one rinsate (R01_20230922) • November 2023: one intra-laboratory duplicate (D01_20231127), and one inter-laboratory duplicate (T01_20231127).
Field Quality Control Results	Intra-laboratory and inter-laboratory duplicate results for each GME are presented in **Table M**, **Appendix 3**. Relative percentage differences (RPDs) were calculated for intra-laboratory and inter-laboratory duplicate pairs of samples. RPDs for most analytes were below the criterion (30%) except for: • March 2023: intra-laboratory duplicate pair E5D/D01_20230324 RPD for dissolved aluminium (125.2%). • March 2023: inter-laboratory duplicate pair E5D/T01_20230324 RPD for total cyanide (89.3%) and total aluminium (51.0%). • June 2023: inter-laboratory duplicate pair W1D/T01_20230622 RPD for total cyanide (35.3%) and total aluminium (89.7%). • September 2023: intra-laboratory duplicate pair G2/D01_20230922 RPD for total aluminium (35.3%). • September 2023: inter-laboratory duplicate pair G2/T01_20230922 RPD for total aluminium (111.1%). There is no criterion for total aluminium. Therefore, these higher RPDs for this analyte are not considered to affect the outcomes of this report. The RPD exceedance reported for dissolved aluminium in intra-laboratory duplicate pair E5D/D01_20230324 was marginally above the acceptance criteria and unlikely to affect the outcomes of this report. Rinsate sample results were all reported at less than the limit of reporting (<LOR) for the four 2023 GMEs, except for September 2023 which reported a concentration of 0.03 mg/l for both total and dissolved aluminium. As dedicated tubing was used for each well and the rinsate was taken from the flow cell for the WQM, this concentration above detection isn't thought to influence the results as purged groundwater does not pass through the flow cell prior to filling sampling bottles.
Equipment Calibration	The water quality meter was calibrated prior to use. Standard practice is to rely on pre-calibration for short sampling periods. Calibration certificates are included in **Appendix 6**.
NATA registered laboratory and NATA endorsed methods	Envirolab was the primary analytical laboratory and ALS was used as the secondary laboratory. The laboratory certificates are NATA stamped.
Analytical methods	Summary analytical methods were included in the laboratory test certificates.
Holding times	Review of laboratory certificates indicated samples were submitted and analysed within appropriate holding times.
Limits of Reporting	LORs for all groundwater analytes were below the assessment criteria.
Laboratory quality control samples	Quality control frequencies were not within specification for total and dissolved metals at the secondary laboratory (ALS).
Laboratory quality control results	The results for laboratory duplicates, laboratory control samples, and surrogates were acceptable, noting that reporting of percentage recovery was not possible in some samples over the four quarters due to high concentrations of elements in the samples however, an acceptable recovery was obtained for the Laboratory Control Sample (LCS).

Ramboll makes the following conclusions regarding the DQIs:

- Completeness: The data for the 2023 GMEs is complete as the selected 28 groundwater wells were located and dipped for depth to groundwater during each GME and groundwater samples were collected from wells containing sufficient water to sample.
- Comparability: The groundwater data collected during the four 2023 GMEs is comparable to previous results as the sampling protocols, analysis methods, quality control methods and monitoring well locations are generally consistent between sampling events and with prior events. The four 2023 GMEs were completed by two samplers, Jake Bourke, and Matilda Englert, both Ramboll environmental scientists.
- Representativeness: The selection of shallow and deep wells on sections along the length of the leachate plume is considered to provide data that is representative of the leachate plume in shallow groundwater and representative of the underlying deep aquifer. Groundwater was sampled following purging to ensure groundwater samples are representative of the aquifer sampled.
- Precision: In the field, Ramboll achieved precision by using standard operating procedures for the collection of groundwater samples and by collecting duplicate and triplicate samples for analysis. Relative Percent Difference (RPD) results for duplicate samples were generally acceptable. Laboratory quality control results indicate precision was achieved at the primary and secondary laboratories.
- Accuracy: In the field, Ramboll achieved accuracy by using Ramboll's standard operating procedures for the collection of groundwater samples. Laboratory quality control results indicate accuracy was achieved at the primary and secondary laboratories.

In general, the DQIs outlined above have been met and Ramboll considers that the data is of suitable quality to meet the project objectives.

6. ASSESSMENT CRITERIA

6.1 Groundwater Assessment Criteria

The assessment criteria adopted for the assessment of groundwater contamination were sourced from the following references:

- NSW DEC (2007) Guidelines for the Assessment and Management of Groundwater Contamination
- ANZECC & ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality
- ANZG (2018) Guidelines for Fresh and Marine Water Quality
- NHMRC (2008) Guidelines for Managing Risks in Recreational Water
- ENVIRON (March 2013) Tier 2 Ecological Risk Assessment, Kurri Kurri Aluminium Smelter

6.2 Potential Beneficial Uses

NSW DEC (2007) indicates that for assessing groundwater quality, it is first necessary to assess the beneficial uses of groundwater and surface water down gradient of the site.

The closest surface water receptor to the site is a dam and then Swamp Creek located approximately 1.5 km to the north-east of the site within an area of the buffer zone used for farming. This drainage area discharges into Wentworth Swamp, which in turn discharges to the Hunter River approximately 15 km north-east of the site near Maitland.

Surface water acidity/alkalinity within the Swamp Creek is described as generally neutral with pH ranging between 7.0 and 7.8 and conductivity is generally fresh, ranging from 626 µS/cm to 1,520 µS/cm. This surface water body is considered to be a freshwater receptor.

Groundwater is expected to follow a subsurface drainage line through a sand filled channel and flow north east towards Swamp Creek. Water level gauging completed during previous investigations confirmed the groundwater flow direction to the north east.

According to the Office of Industry and Investment, NSW, there are 17 licensed groundwater abstractions (bores) located within the site, which are known to be associated with monitoring of groundwater impact. There are no other licensed groundwater bores within 2 km of the site.

Potential beneficial uses of groundwater down gradient of the site include:

- Discharge into Swamp Creek, which supports aquatic ecosystems, is used for recreational fishing and flows into Wentworth Swamp, which potentially flows into the Hunter River
- Extraction of water from Swamp Creek may also be used for stock watering and/or irrigation.

Drinking water has not been included as a potential beneficial use of water from Swamp Creek for the following reasons:

- Drinking water supply to the local communities is reticulated and originates from Chichester Dam on the Chichester River
- The Kurri Wastewater Treatment Works is located up gradient of the site. The works has a licensed discharge point into Swamp Creek.

6.3 Appropriate Criteria for Groundwater

Based on the review of potential beneficial uses of groundwater and surface water within the closest receptor, the criteria for protection of aquatic ecosystems, irrigation, stock watering and recreational use will be used.

The investigation levels presented in ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality are considered applicable for the protection of aquatic ecosystems of receiving waters. ANZG (2018) advocates a site-specific approach to developing guideline trigger values based on such factors as local biological affects data and the current levels of disturbance of

the ecosystem. The guidelines present 'low risk trigger values' which are defined as concentrations of key performance parameters below which there is a low risk of adverse biological effects. If these trigger values are exceeded, then further action is required which may include further site-specific investigations to assess potential contamination or management and remedial actions.

Low risk trigger values are presented in ANZG (2018) for the protection of 80-99% of species in fresh and marine waters, with trigger values depending on the health of the receiving waters.

Groundwater results will be compared against trigger values for the protection of 95% of freshwater species. A 95% protection of freshwater species was selected due to the indication from the Hunter Catchment Management Trust that declining stream water quality and a reduction in diversity of native plants and animals has occurred in the last ten years.

A guideline for fluoride that is protective of the environment has not been developed in Australia.

A summary of the assessment criteria for groundwater is presented in **Table 5-1**.

Table 5-1: Groundwater Assessment Criteria

Contaminant	95% Protection for Aquatic Ecosystems	Irrigation	Stock Watering	Recreational
Aluminium (mg/L)	0.055	5	5	0.2[d]
Fluoride (mg/L)	No guideline	1	2	1.5[e]
Free Cyanide (mg/L)	0.007	No guideline	No guideline	0.8
pH (pH Units)	6.5 - 8[a]	No guideline	No guideline	6.5 - 8.5[d]
Electrical Conductivity (µS/cm)	No guideline	4,500 – 7,700[b] >12,200[c]	No guideline	No guideline

[a] *Values for lowland rivers from Table 3.3.2 in ANZECC (2000).*
[b] *Values for tolerant crops from Table 4.2.4 in ANZECC (2000).*
[c] *Value from Table 4.2.4 in ANZECC (2000) for where electrical conductivity is 'generally too saline' for plant growth.*
[d] *Aesthetic only, insufficient data to set a guideline value based on health considerations.*
[e] *Value from Ramboll (2023) Tier 1 Screening Human Health Guideline Values, Fluoride and Aluminium*

7. RESULTS AND TREND ANALYSIS

A summary of groundwater elevation, pH, and laboratory results for the past 41 GMEs, including the four quarterly GMEs from 2023 are included in **Appendix 3**. Groundwater field parameter forms are included in **Appendix 4**, laboratory reports are included in **Appendix 5** and calibration certificates for the groundwater quality meter and interface probe are included in **Appendix 6**.

The identified contaminants of concern associated with the leachate are fluoride, cyanide, and aluminium. Fluoride has been selected as the primary contaminant of concern because of its persistence observed in groundwater and its concentration range in comparison with the adopted guideline criteria. Aluminium was not selected due to its ubiquity in the environment generally.

The following parameters have been assessed in the following sections:

- Section 6.1: Shallow Aquifer
    - Section 6.1.1: Groundwater Elevation and Flow Direction
    - Section 6.1.2: Groundwater pH
    - Section 6.1.3: Soluble Fluoride
    - Section 6.1.4: Free Cyanide
- Section 6.2: Deep Aquifer
    - Section 6.2.1: Groundwater Elevation and Flow Direction
    - Section 6.2.2: Groundwater pH
    - Section 6.2.3: Soluble Fluoride
    - Section 6.2.4: Free Cyanide

7.1 Shallow Aquifer

7.1.1 Groundwater Elevation and Flow Direction

Figure 6-1 shows groundwater elevation within the shallow aquifer across the 41 GMEs completed between July 2013 and November 2023. Monthly rainfall is presented for the same period.

Historical groundwater elevation within the shallow aquifer generally shows an increase in response to heavy rainfall and a downward trend in groundwater elevation during extended periods of low rainfall.

The reporting year of 2023 was a period of low rainfall, with the highest rainfall in the first three months of the year. Water levels within the shallow aquifer had increased marginally over 2022, which was a period of higher rainfall, and then declined in 2023. Monitoring events in both September 2023 and late November 2023 had a high number of dry wells in the shallow aquifer, as outlined in **Table 6-1**.

Table 6-1: Dry Wells in the Shallow Aquifer

Section	Wells dry in March 2023	Wells dry in June 2023	Wells dry in Sept 2023	Wells dry in Nov 2023
Section 1	W2S, W7S	W2S, W7S, E5	W2S, W7S, E5	W2S, W7S, E5
Section 2	-	-	W1S	W1S
Section 3	W4S	W4S	W4S, A7	W4S, A7
Section 4	W5S	W5S	W5S, E11	W5S, E11
Section 5	W6S	W6S	W6S	W6S, N9

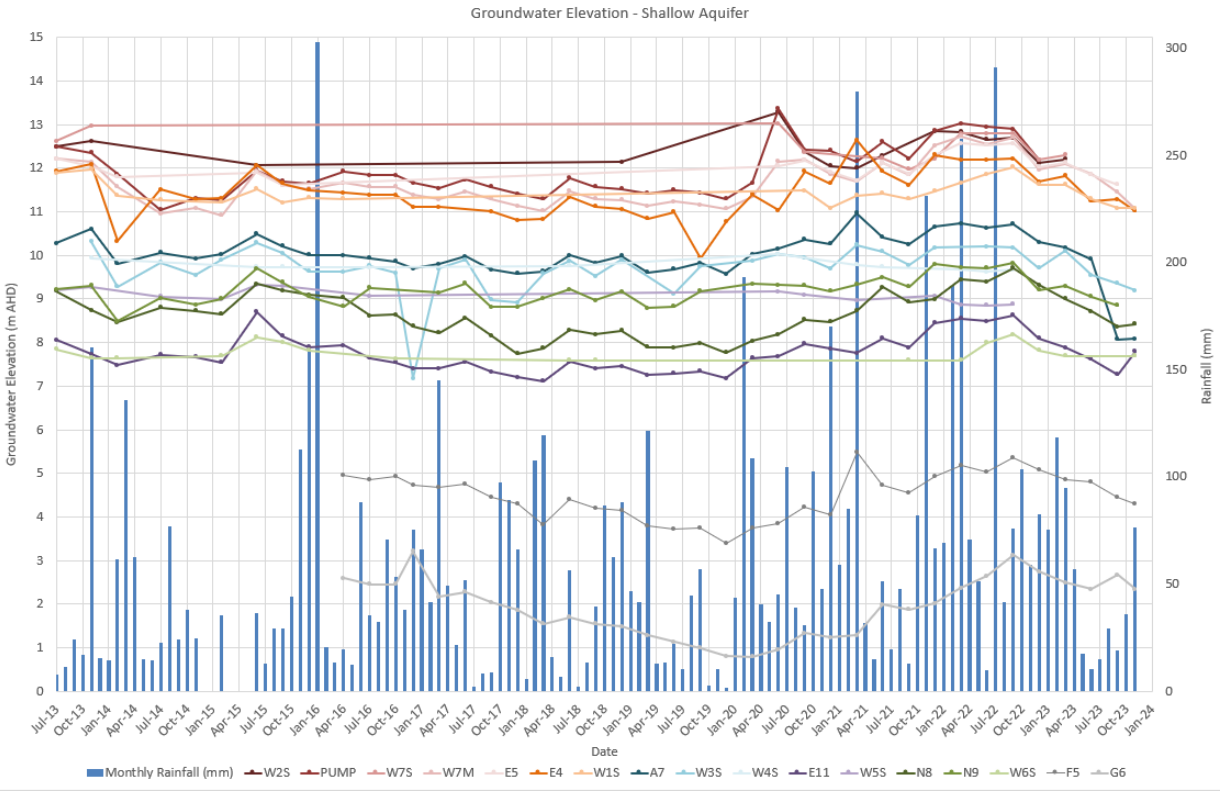

Figure 6-1: Groundwater Elevation – Shallow Aquifer, 2013 to 2023

Interpreted groundwater flow directions within the shallow aquifer for the four GMEs completed during 2023 is presented in **Figure 6-2**.

Between March 2023 and November 2023, groundwater flow within the shallow aquifer was generally to the north and northeast with a centralised low area at E11. Historical elevations and flow directions are attached in **Appendix 7**.

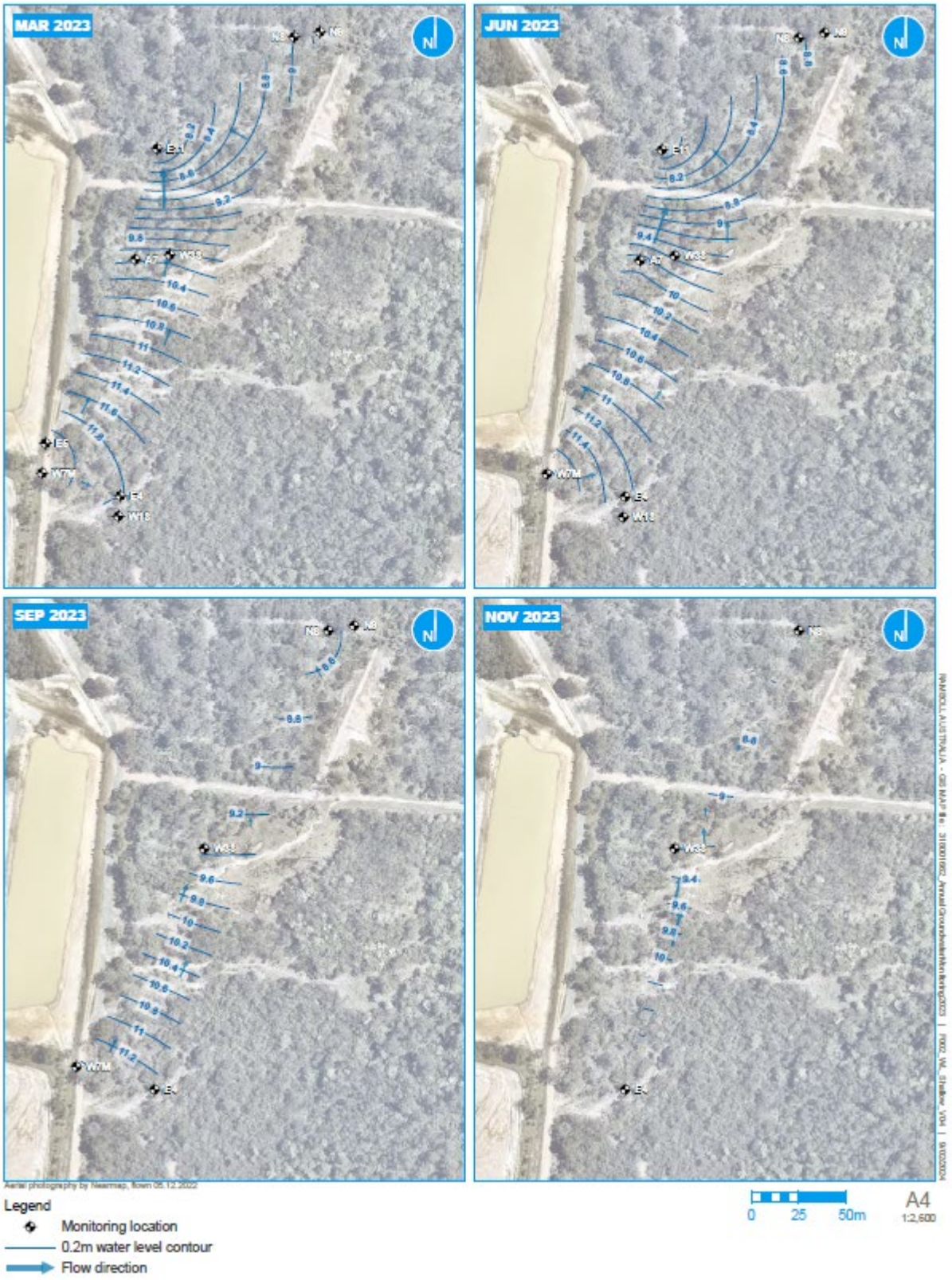

Figure 6-2: Interpolated Groundwater Elevation and Flow Direction – Shallow Aquifer 2023

7.1.2 Groundwater pH

Table 6-1 summarises field pH values reported within the shallow aquifer during 2023. Complete results are included in **Appendix 3.**

Table 6-2: Field pH Values - Shallow Aquifer

Contaminant of Concern (CoC)	Date	No. of Samples	Minimum Value (pH Units)	Maximum Value (pH Units)	No. Results Exceeding Criteria	
					95% Protection (<6.5 - >8 pH units)	Recreational (<6.5 - >8.5 pH units)
Field pH	March 2023	12	4.5	9.65	**8**	**6**
	June 2023	10	4.5	10.4	**8**	**7**
	September 2023	7	4.5	10.4	**6**	**5**
	November 2023	5	4.0	9.8	**4**	**3**

A pH greater than 8 exceeds the ANZECC (2000) 95% protection for aquatic species criteria and a pH greater than 8.5 exceed the recreational criteria. Wells with a pH greater than 9, which is characteristic of leachate impacted groundwater, include the following:

- Section 1: E5 and W7M
- Section 2: E4
- Section 3: A7
- Section 4: None
- Section 5: None

Section 1 well, PUMP, which exceeded the site assessment criteria in 2022, was destroyed and could not be sampled in 2023.

Over the 2023 monitoring period, pH increased slightly during the June 2023 and September 2023 monitoring events, however the majority of shallow wells were dry during the November 2023 monitoring event. Ranges for pH within the shallow aquifer were similar to historical ranges.

The pH in shallow sentinel wells F5 and G6 near Swamp Creek were less than 5, which may be indicative of the natural pH of groundwater in this part of the Buffer Zone. Although this pH is below the range for ANZECC (2000) 95% protection criteria, it is not considered to require further analysis as it is not indicative of leachate impact.

The lateral extent of high pH impacted groundwater in the shallow aquifer throughout 2023 is presented in **Figure 6-3**.

Figure 6-3: Interpolated Field pH – Shallow Aquifer 2023

7.1.2.1 Time Series Trends

Comparison of pH values for the 41 GMEs completed between July 2013 and November 2023 are shown in **Figure 6-4** to **Figure 6-6**. The blue dotted line shows pH 9, pH above this is characteristic of leachate impact. The time series trends show the following:

- The consistent presence of groundwater with elevated pH at shallow wells E4, E5, W7M and A7 along the length of the plume
- Low pH of groundwater in sentinel wells F5 and G6.

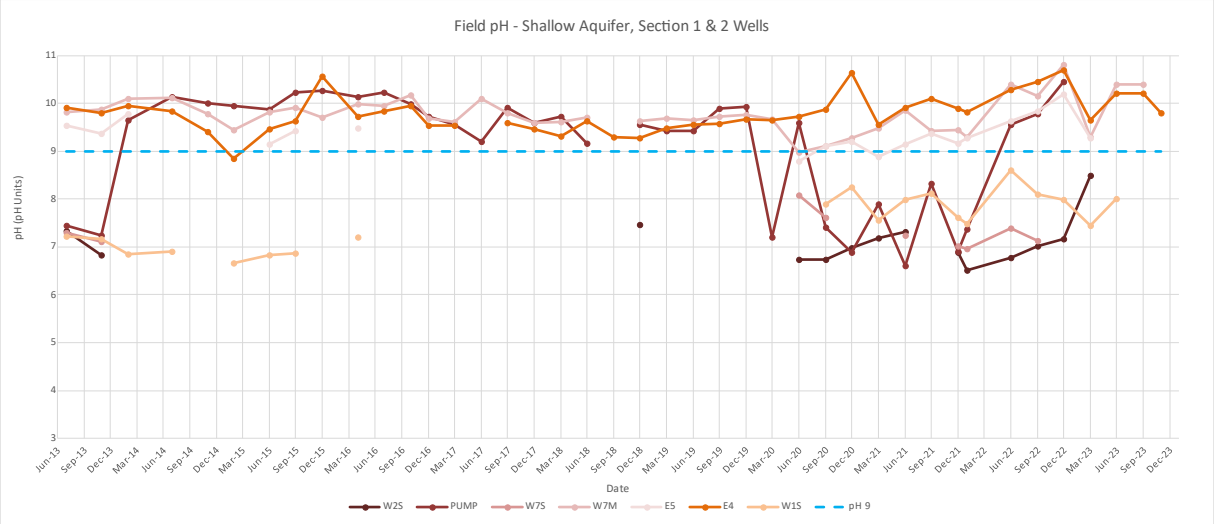

Figure 6-4: Field pH Values – Shallow Aquifer, Section 1 & 2 Wells

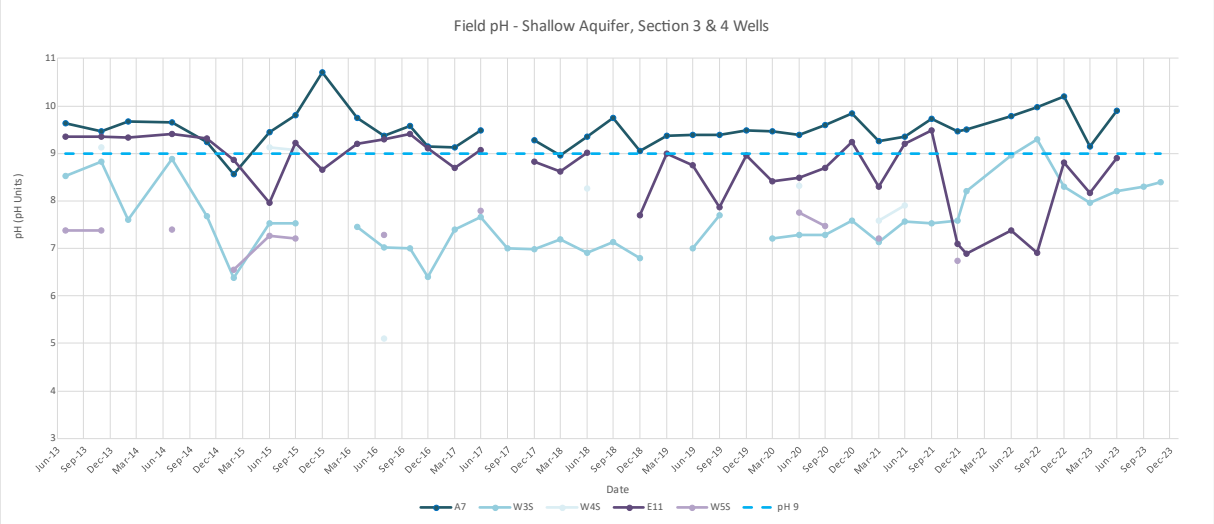

Figure 6-5: Field pH Values – Shallow Aquifer, Section 3 & 4 Wells

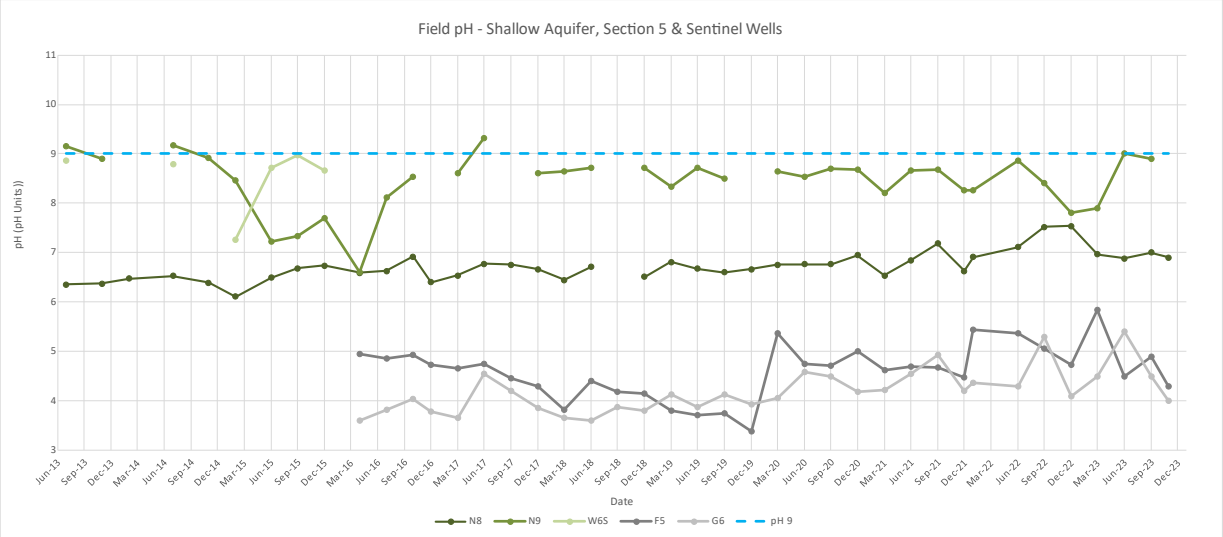

Figure 6-6: Field pH Values – Shallow Aquifer, Section 5 & Sentinel Wells

7.1.2.2 Mann-Kendall Trend Analysis

Mann-Kendall trend analysis was used to statistically assess each of the shallow monitoring locations to identify trends in pH. Trend analysis was carried out using the GSI Environmental Mann-Kendall Toolkit (GSI 2012). The outputs from the Mann-Kendall Toolkit are provided in **Appendix 8**. Data from November 2013 to December 2022 (40 GMEs) were included for the purpose of Mann-Kendall trend analysis of pH. One GME (July 2013) was excluded from the Mann Kendall Toolkit as the methodology is only valid for between four and 40 samples. A summary is provided in **Table 6-2**.

Mann-Kendall trend analysis of pH within the shallow aquifer between 2013 and 2023 indicates an increasing trend at nine of the fifteen locations. Of these nine locations, three locations (E5, E4 and A7) have visual characteristics of leachate impact (i.e., yellow/ brown colouration) and a pH exceeding the assessment criteria. Only one other location (W7M) with visual characteristics of leachate impact (i.e., yellow/ brown colouration) and a pH exceeding the assessment criteria has a 'stable' trend.

Increasing trends in pH along the length of the leachate plume occur at locations with no evidence of leachate impact (W3S, N8, N9, G6), aside from W1S and W2S which have a pH exceeding the assessment criteria but no visual characteristics of leachate impact.

Table 6-3: Mann-Kendall pH Trends - Shallow Aquifer

Well	Previous Trend 2013 to 2022	Current Trend 2013 to 2023	pH >Assessment Criteria[1]	Leachate Impacted[2]
Section 1				
~~PUMP~~	~~**Decreasing**~~	Well Destroyed	Well Destroyed	Well Destroyed
W2S	**Increasing**	**Increasing**	**Yes**	No
W7M	Prob. Decreasing	Stable	**Yes**	**Yes**
W7S	**Increasing**	-	-	No
E5	Prob. Increasing	**Increasing**	**Yes**	**Yes**
Section 2				
E4	**Increasing**	**Increasing**	**Yes**	**Yes**
W1S	**Increasing**	**Increasing**	**Yes**	No

Well	Previous Trend 2013 to 2022	Current Trend 2013 to 2023	pH >Assessment Criteria[1]	Leachate Impacted[2]
Section 3				
W3S	No Trend	**Increasing**	No	No
W4S	-	-	-	No
A7	**Increasing**	**Increasing**	**Yes**	**Yes**
Section 4				
E11	**Stable**	Stable	**Yes**	No
W5S	-	-	-	No
Section 5				
N8	**Increasing**	**Increasing**	No	No
N9	**Increasing**	**Increasing**	No	No
W6S	No Trend	-	-	No
Sentinel				
F5	No Trend	No Trend	No	No
G6	**Increasing**	**Increasing**	No	No

- Indicates no 2022 and/or 2023 data available.
[1]Field pH exceeded the assessment criteria for 95% Protection for Aquatic Ecosystems or Recreational criteria during any GME completed in 2023.
[2]Groundwater generally characteristic of leachate impact i.e., pH >9, brown in colour.

7.1.3 Soluble Fluoride

Table 6-3 summarises the laboratory results for soluble fluoride within the shallow aquifer during 2023. Complete results are included in **Appendix 3**.

Table 6-4: Soluble Fluoride Concentrations - Shallow Aquifer

CoC	Date	No. of Samples	Minimum Conc. (mg/L)	Maximum Conc. (mg/L)	No. Results Exceeding Criteria		
					Irrigation (>1 mg/L)	Stock Watering (>2 mg/L)	Rec. (>15 mg/L)
Soluble Fluoride	March 2023	10	0.20	740	**8**	**8**	**7**
	June 2023	9	0.20	600	**7**	**7**	**6**
	September 2023	6	0.20	710	**4**	**4**	**4**
	November 2023	4	0.30	760	**2**	**2**	**2**

During the four GMEs completed in 2023, soluble fluoride concentrations in shallow groundwater exceeded the site assessment criteria for Irrigation, Stock Watering or Recreational use at up to eight wells as follows:

- Section 1: W7M, E5
- Section 2: E4, W1S
- Section 3: W3S, A7
- Section 4: E11

- Section 5: N9

Section 1 wells PUMP and W2S, and Section 5 well W6S, exceeded the site assessment criteria during 2022, but were either dry or destroyed during 2023 and could not be sampled.

Except for Section 5 well N8, all Section 1, Section 2, Section 3, and Section 4 shallow wells exceeded one or more site assessment criteria for soluble fluoride during 2023, with concentrations generally decreasing to the northeast away from the CWS. The highest concentrations were generally reported at Section 2 well E4 located hydraulically downgradient of Section 1. The sentinel wells F5 and G6, located adjacent to the nearest surface water receptor (Swamp Creek), have consistently reported fluoride concentrations below 1 mg/L, indicating no impact from the leachate plume. The lateral extent of soluble fluoride in the shallow aquifer throughout 2023 is presented in **Figure 6-7**.

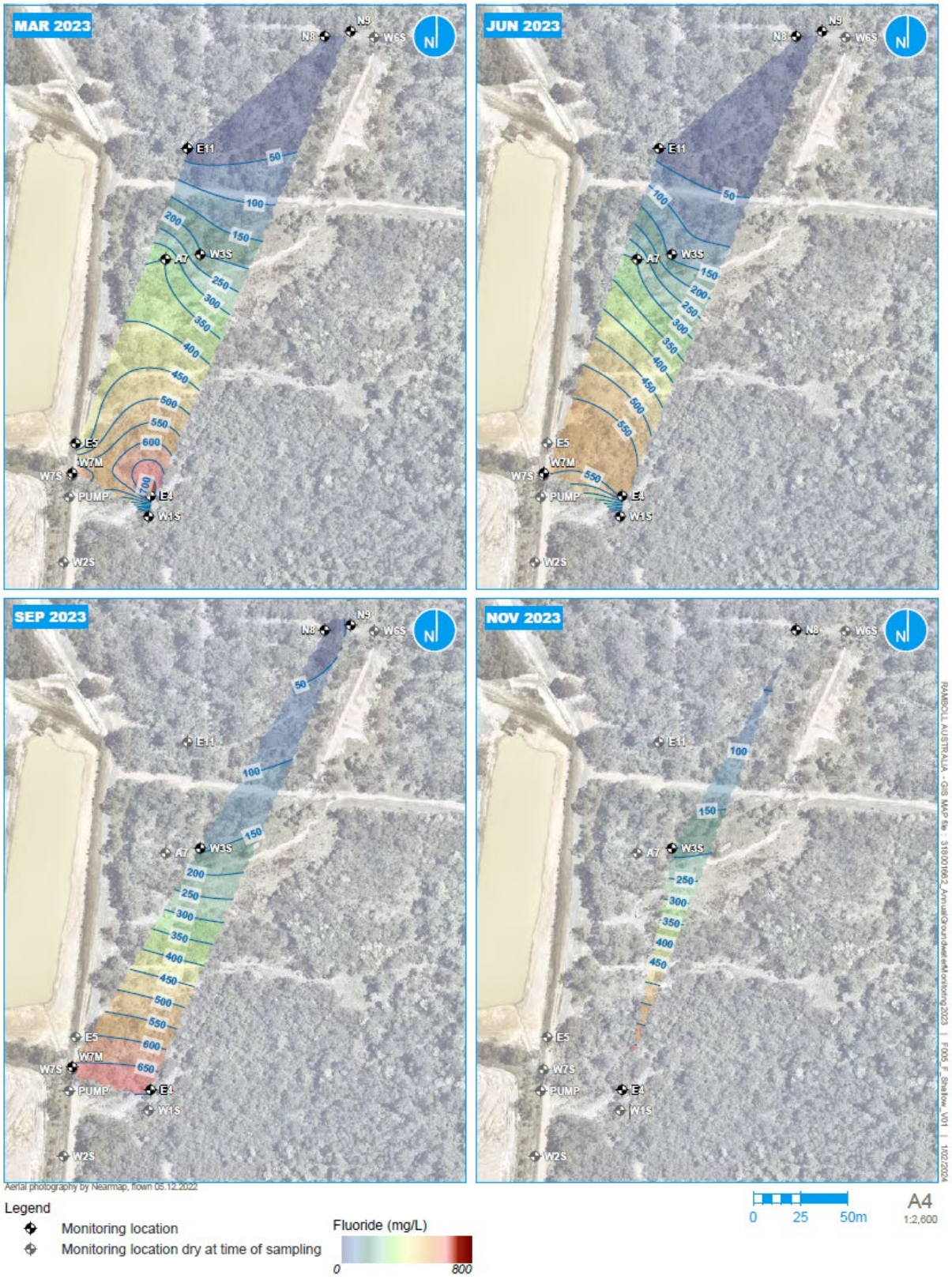

Figure 6-7: Interpolated Soluble Fluoride - Shallow Aquifer 2023

7.1.3.1 Time Series Trends

Comparison of soluble fluoride concentrations for the 41 GMEs completed between July 2013 and November 2023 are shown in **Figure 6-8** to **Figure 6-10**. Assessment criteria has not been plotted on the graphs due to the elevated groundwater concentrations. The time series trends show the following:

- Fluctuating soluble fluoride concentrations in wells on Section 1 and Section 2, closest to the source of the leachate
- Increasing soluble fluoride concentrations at E4 since September 2017
- Consistently elevated soluble fluoride concentrations indicating leachate impact at Section 3 and Section 4 wells
- Overall decreasing soluble fluoride concentrations at well N9 on Section 5, the leading edge of the plume
- Consistently low soluble fluoride concentrations at the sentinel wells F5 and G6.

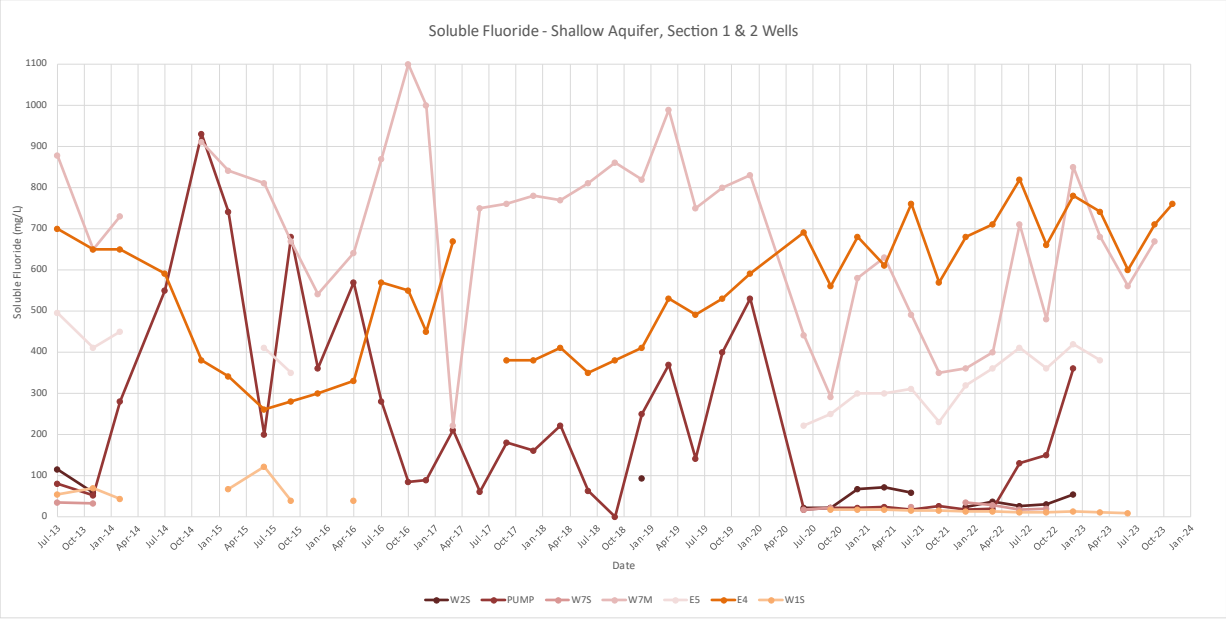

Figure 6-8: Soluble Fluoride Concentrations – Shallow Aquifer, Section 1 & 2 Wells

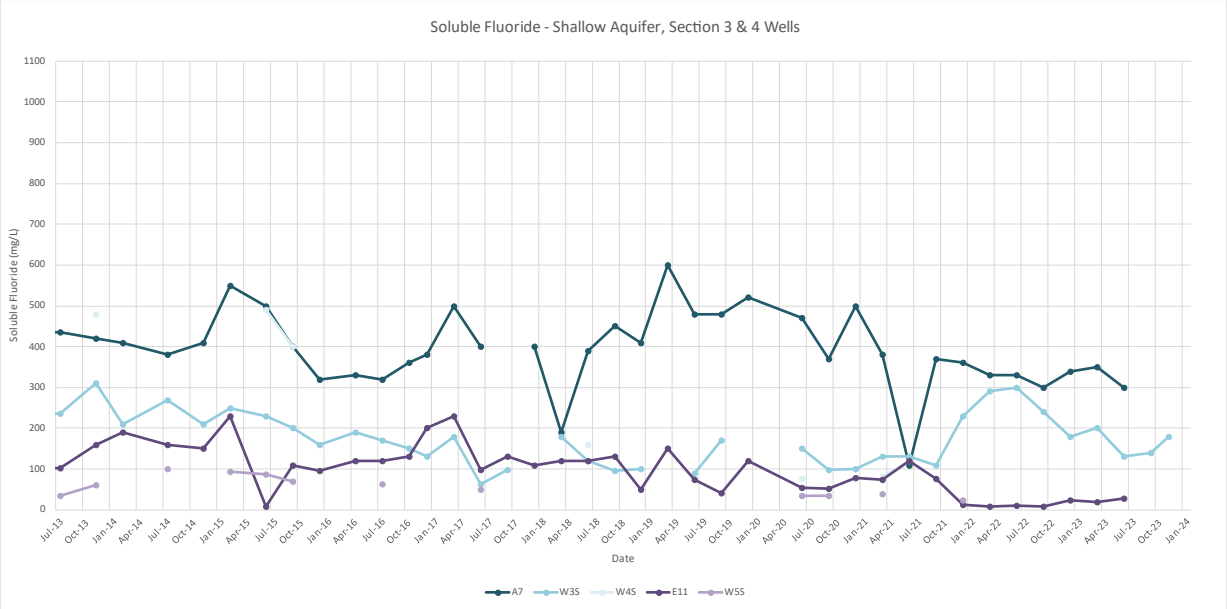

Figure 6-9: Soluble Fluoride Concentrations – Shallow Aquifer, Section 3 & 4 Wells

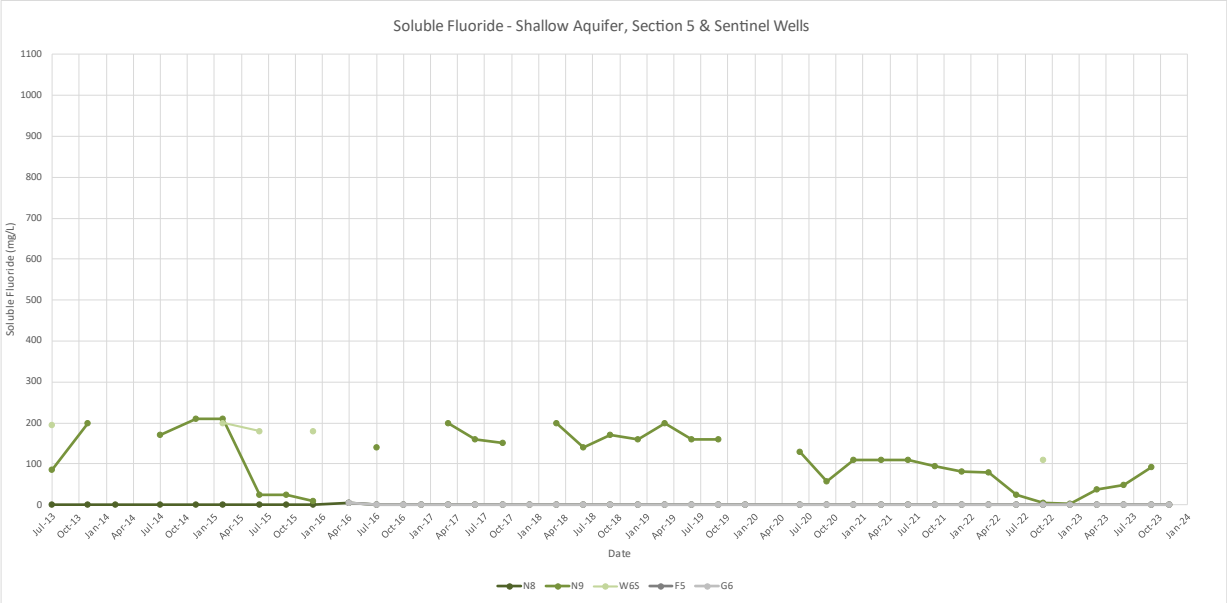

Figure 6-10: Soluble Fluoride Concentrations – Shallow Aquifer, Section 5 & Sentinel Wells

7.1.3.2 Mann-Kendall Trend Analysis

Data from November 2013 to December 2023 (40 sampling events) were included for the purpose of Mann-Kendall trend analysis of soluble fluoride. One GME (July 2013) was excluded from the Mann Kendall Toolkit as the methodology is only valid for between four and 40 samples. A summary is provided in **Table 6-4**.

Mann-Kendall trend analysis of soluble fluoride within the shallow aquifer indicates an increasing trend at four wells, E4 (located on Section 2), N8 (located on Section 4), and F5 and G6 (sentinel). Further review of soluble fluoride concentrations at E4 indicate the increase to be minor, from 699 mg/L in July 2013 to 760 mg/L in November 2023. Soluble fluoride concentrations at N8, F5 and G6 are within natural fluctuations and pH is not characteristic of leachate impacted groundwater at these locations.

Mann-Kendall trend analysis of soluble fluoride at N9, the well at the leading edge of the plume, shows a decreasing trend indicating the plume is not expanding to the north.

Table 6-5: Mann-Kendall Trend Analysis of Soluble Fluoride – Shallow Aquifer

Well	Previous Trend 2013 to 2022	Current Trend 2013 to 2023	Soluble Fluoride >Assessment Criteria[1]	Leachate Impacted[2]
Section 1				
~~PUMP~~	~~**Decreasing**~~	Well Destroyed	Well Destroyed	Well Destroyed
W2S	**Stable**	**-**	-	No
W7M	**Decreasing**	**Decreasing**	**Yes**	**Yes**
W7S	**Stable**	**-**	-	No
E5	**Stable**	No Trend	**Yes**	**Yes**
Section 2				
E4	**Increasing**	**Increasing**	**Yes**	**Yes**
W1S	**Decreasing**	**Decreasing**	**Yes**	No
Section 3				
W3S	**Decreasing**	Prob. Decreasing	**Yes**	No
W4S	**-**	**-**	-	No
A7	**Decreasing**	**Decreasing**	**Yes**	**Yes**
Section 4				
E11	**Decreasing**	**Decreasing**	**Yes**	No
W5S	-	-	-	No
Section 4				
N8	**Increasing**	**Increasing**	No	No
N9	**Decreasing**	**Decreasing**	**Yes**	No
W6S	Prob. Decreasing	-	-	No
Sentinel				
F5	Prob. Increasing	**Increasing**	No	No
G6	**Increasing**	**Increasing**	No	No

- Indicates no 2022 and/or 2023 data available.
[1]Soluble fluoride exceeded the assessment criteria of either Irrigation, Stock Watering or Recreational during any GME completed in 2023.
[2]Groundwater generally characteristic of leachate impact i.e., pH >9, brown in colour.

7.1.4 Free Cyanide

Both total and free cyanide were included for analysis in the 2023 GMEs. Free cyanide was introduced for analysis in 2015, as there are no Australian guidelines for total cyanide.

Laboratory results for free cyanide in shallow groundwater reported during 2023 are summarised in **Table 6-5**.

Table 6-6: Free Cyanide Concentrations - Shallow Aquifer

CoC	Date	No. of Samples	Minimum Conc. (mg/L)	Maximum Conc. (mg/L)	No. Results Exceeding Criteria	
					95% Protection (>0.007 mg/L)	Recreational (>0.8 mg/L)
Free Cyanide	March 2023	10	<0.004	0.012	**3**	0
	June 2023	9	<0.004	0.068	**2**	0
	September 2023	6	<0.004	0.018	**1**	0
	November 2023	4	<0.004	0.29	**2**	0

Free cyanide concentrations exceeded the ANZECC (2000) 95% protection for aquatic ecosystems criterion in the following wells:

- Section 1: E5
- Section 2: E4
- Section 3: W3S

Section 1 well, PUMP, exceeded the 95% protection for aquatic ecosystems criterion in 2022 but was destroyed during 2023 and could not be sampled. Remaining locations generally reported free cyanide concentrations below the laboratory limit of reporting.

7.1.4.1 Time Series Trends

Comparison of free cyanide concentrations for the 36 GMEs completed between February 2015 and November 2023 are shown in **Figure 6-11** to **Figure 6-13**. Assessment criteria for 95% species protection (0.007 mg/L) has not been plotted on the graphs due to the historical elevated groundwater concentrations. Overall, concentrations of free cyanide in groundwater have decreased between 2015 and 2023 with no detections above the human health recreational guideline value of 0.8 mg/L since June 2015. Concentrations of free cyanide seemed to increase slightly at Section 2 well E4 and Section 3 well W3S between September 2023 and November 2023, but concentrations at both wells still reported well below the human health recreational guideline.

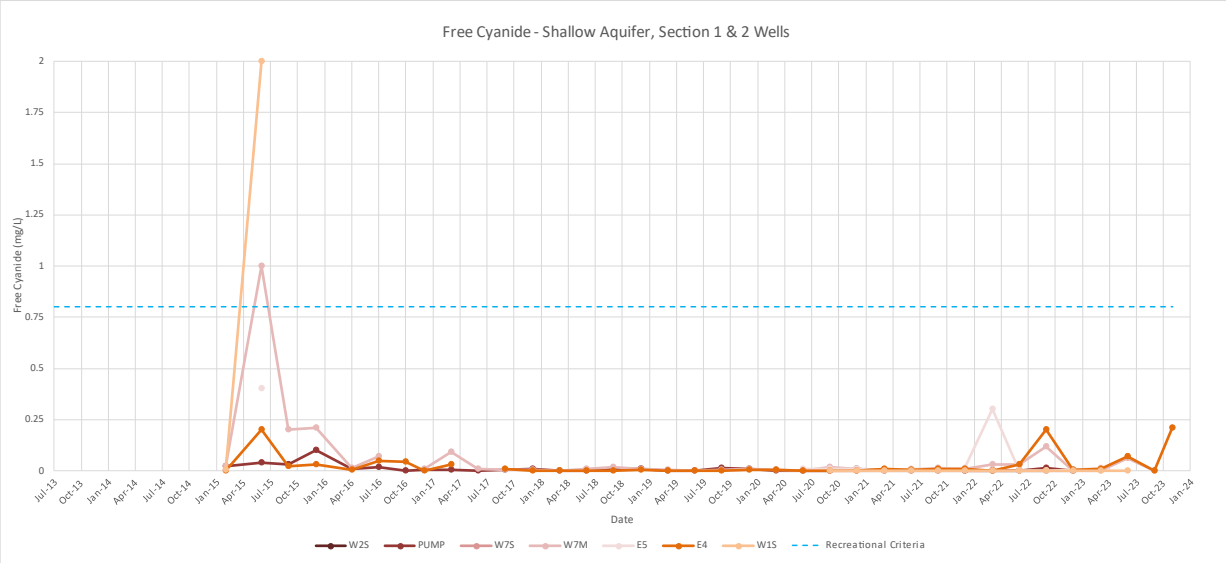

Figure 6-11: Free Cyanide Concentrations – Shallow Aquifer, Section 1 & 2 Wells

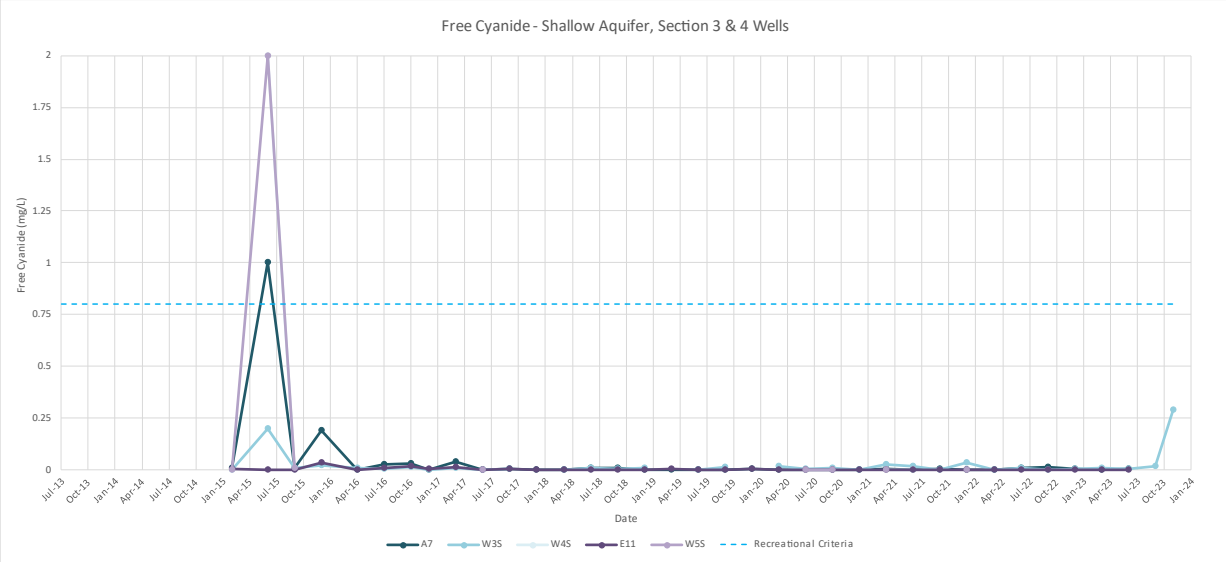

Figure 6-12: Free Cyanide Concentrations – Shallow Aquifer, Section 3 & 4 Wells

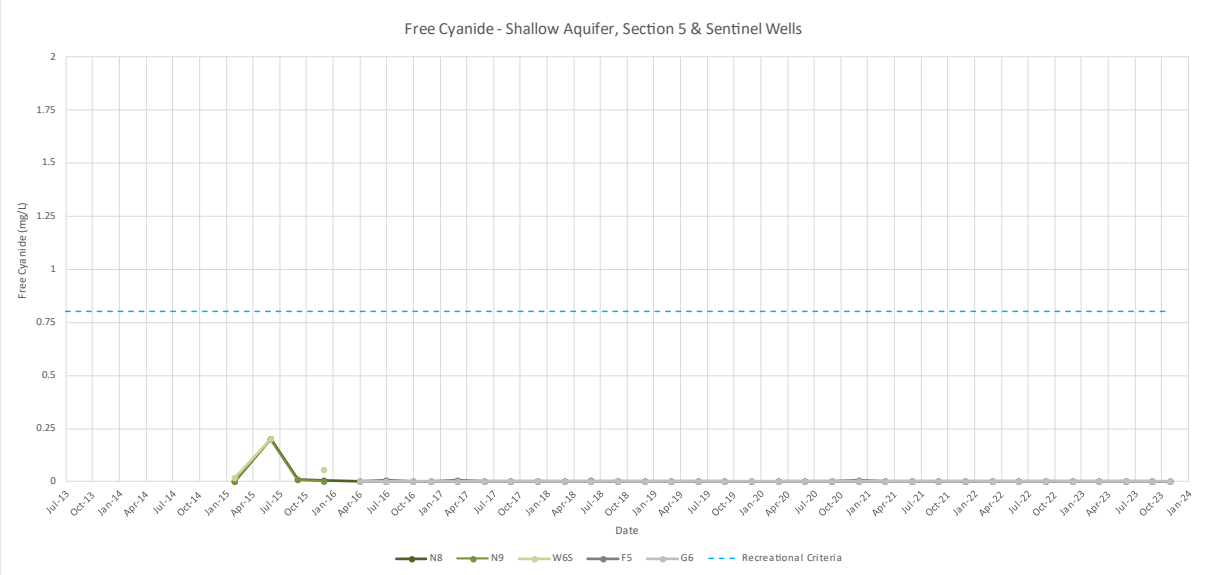

Figure 6-13: Free Cyanide Concentrations - Shallow Aquifer, Section 5 & Sentinel Wells

7.1.4.2 Mann-Kendall Trend Analysis

Data from February 2015 to December 2022 (36 sampling events) were included for the purpose of Mann-Kendall trend analysis of free cyanide in the shallow aquifer, a summary is provided in **Table 6-6**.

Mann-Kendall trend analysis of free cyanide in shallow groundwater indicates no increasing trends.

Table 6-7: Mann-Kendall Trend Analysis of Free Cyanide Trends - Shallow Aquifer

Well	Previous Trend 2015 to 2022	Current Trend 2015 to 2023	Free Cyanide >Assessment Criteria[1]	Leachate Impacted[2]
Section 1				
~~PUMP~~	~~**Decreasing**~~	Well Destroyed	Well Destroyed	Well Destroyed
W2S	Stable	**-**	-	No
W7M	No Trend	No Trend	No	**Yes**
W7S	Stable	**-**	-	No
E5	No Trend	No Trend	**Yes**	**Yes**
Section 2				
E4	No Trend	No Trend	**Yes**	**Yes**
W1S	No Trend	No Trend	No	No
Section 3				
W3S	No Trend	No Trend	**Yes**	No
W4S	-	-	-	No
A7	No Trend	No Trend	No	**Yes**
Section 4				
E11	**Decreasing**	**Decreasing**	No	No
W5S	-	-	-	No
Section 5				
N8	Stable	Stable	No	No
N9	Stable	Stable	No	No
W6S	No Trend	-	-	No
Sentinel				
F5	Stable	Stable	No	No
G6	Stable	Stable	No	No

- Indicates no 2022 and/or 2023 data available.

[1] Free cyanide exceeded the assessment criteria of either 95% Protection of Aquatic Ecosystems or Recreational during any GME completed in 2023.

[2] Groundwater generally characteristic of leachate impact i.e., pH >9, brown in colour.

7.2 Deep Aquifer

7.2.1 Groundwater Elevation and Flow Direction

Figure 6-14 shows groundwater elevation within the deep aquifer across the 41 GMEs completed between July 2013 and November 2023. Monthly rainfall is presented for the same period.

Groundwater levels within the deep aquifer decreased over the period of low rainfall between 2017 and 2019 then increased in response to increased rainfall in 2020, 2021 and 2022. The current year of 2023 was a period of low rainfall and groundwater levels decreased over 2023.

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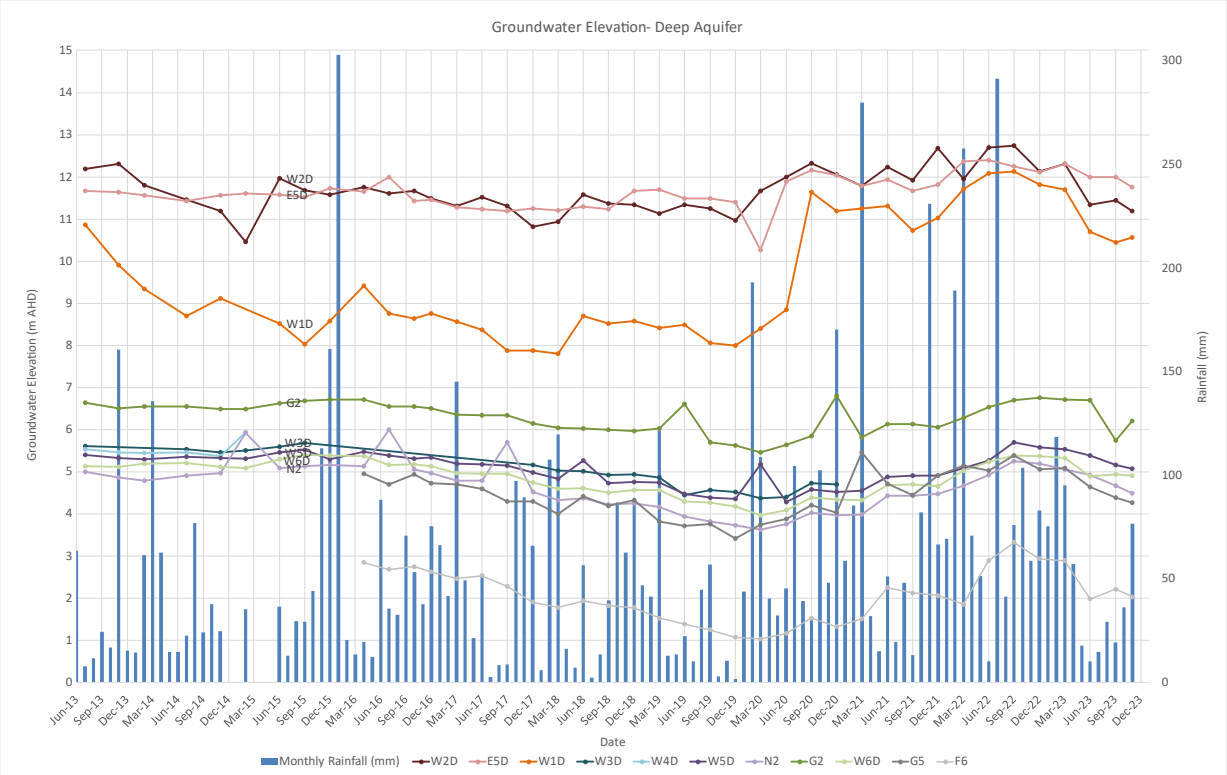


Figure 6-14: Groundwater Elevation – Deep Aquifer, 2013 to 2023

Interpreted groundwater flow directions within the deep aquifer for the four GMEs completed during 2023 is presented in **Figure 6-15**. Historical elevations and flow directions are attached in **Appendix 7**.

Groundwater flow direction in the deep aquifer is to the northeast. The deep aquifer shows little variation in flow direction between June 2013 and November 2023. There is a consistent gradient from approximately 11 m AHD near E5D to approximately 5 m AHD near W5D.

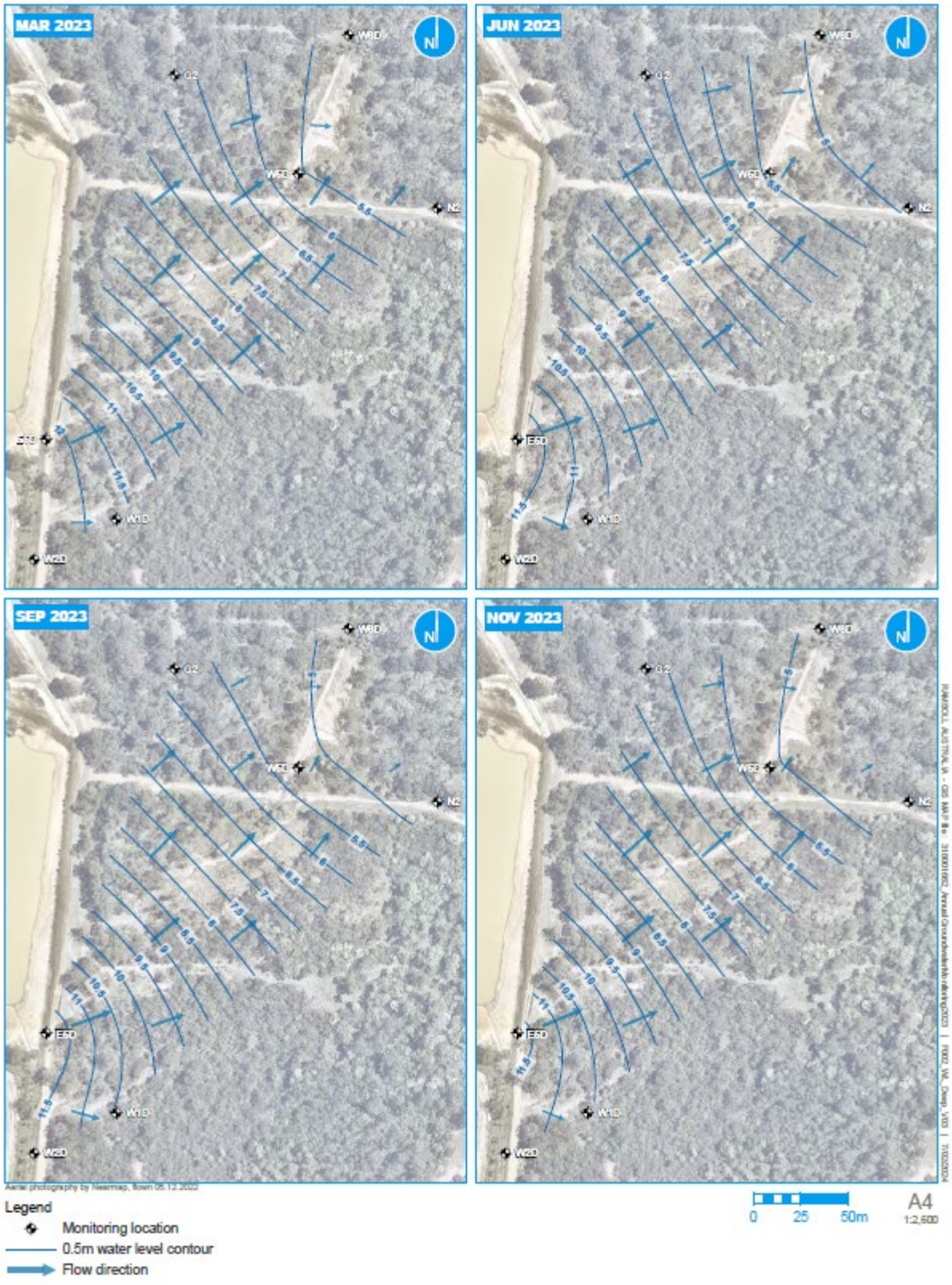


Figure 6-15: Interpolated Groundwater Elevation and Flow Direction – Deep Aquifer 2023

7.2.2 Groundwater pH

Table 6-7 summarises field pH values reported within the deep aquifer during 2023. Complete results are included in **Appendix 3.**

Table 6-8: Field pH Values – Deep Aquifer

CoC	Date	No. of Samples	Minimum Value (pH Units)	Maximum Value (pH Units)	No. Results Exceeding Criteria	
					95% Protection (<6.5 - >8 pH units)	Recreational (<6.5 - >8.5 pH units)
Field pH	March 2023	9.00	4.85	10.02	**3**	**3**
	June 2023	9.00	3.70	10.60	**6**	**6**
	September 2023	9.00	4.90	10.60	**5**	**5**
	November 2023	9.00	4.00	10.20	**6**	**6**

The deep aquifer has generally not been impacted by leachate with pH levels largely below pH 8, except for W2D located on Section 1. The pH at W2D has consistently been greater than 9 indicating leachate impacted groundwater at this well. The pH at W1D has gradually increased since 2019 and has reported variable pH values above and below the assessment criteria for 95% species protection since December 2020. During 2023 the groundwater pH at W1D consistently within the assessment criteria for 95% species protection and recreational use.

The natural pH conditions in the deep aquifer are slightly acidic to neutral, with pH conditions generally within or below the trigger values for lowland rivers of 6.5 to 8 (ANZECC 2000).

The lateral extent of high pH impacted groundwater in the deep aquifer throughout 2023 is presented in **Figure 6-16**.

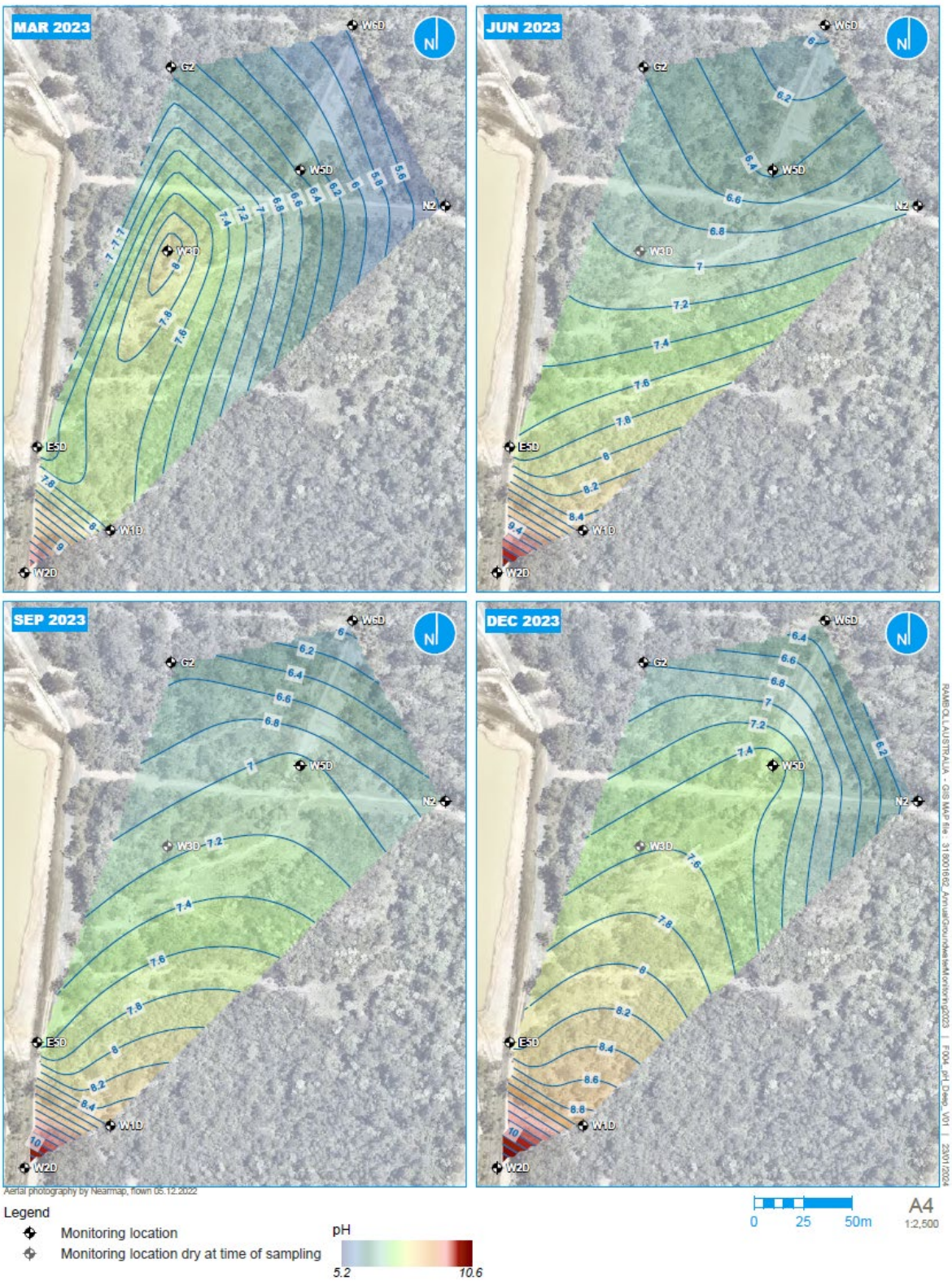


Figure 6-16: Interpolated Field pH – Deep Aquifer 2023

7.2.2.1 Time Series Trends

Comparison of pH values reported within the deep aquifer for the 41 GMEs completed between July 2013 and November 2023 are shown in **Figure 6-17** to **Figure 6-19**. The blue dotted line shows pH 9 which is indicative of leachate impact.

The time series trends show the following:

- Consistently elevated pH above 9 at well W2D on Section 1
- pH consistently below 8 in down gradient and sentinel wells.

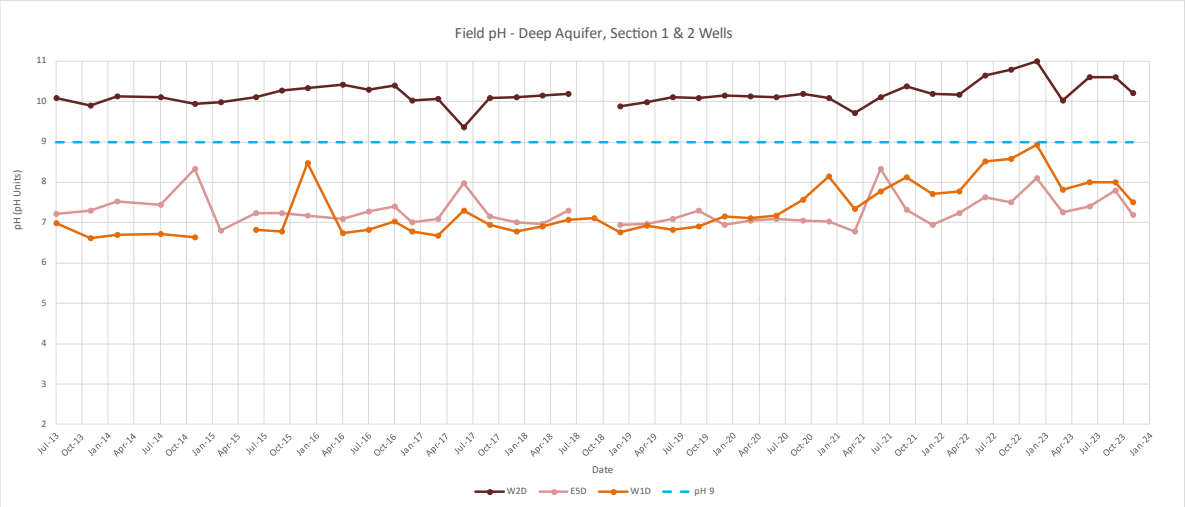


Figure 6-17: Field pH Values – Deep Aquifer, Section 1 & 2 Wells

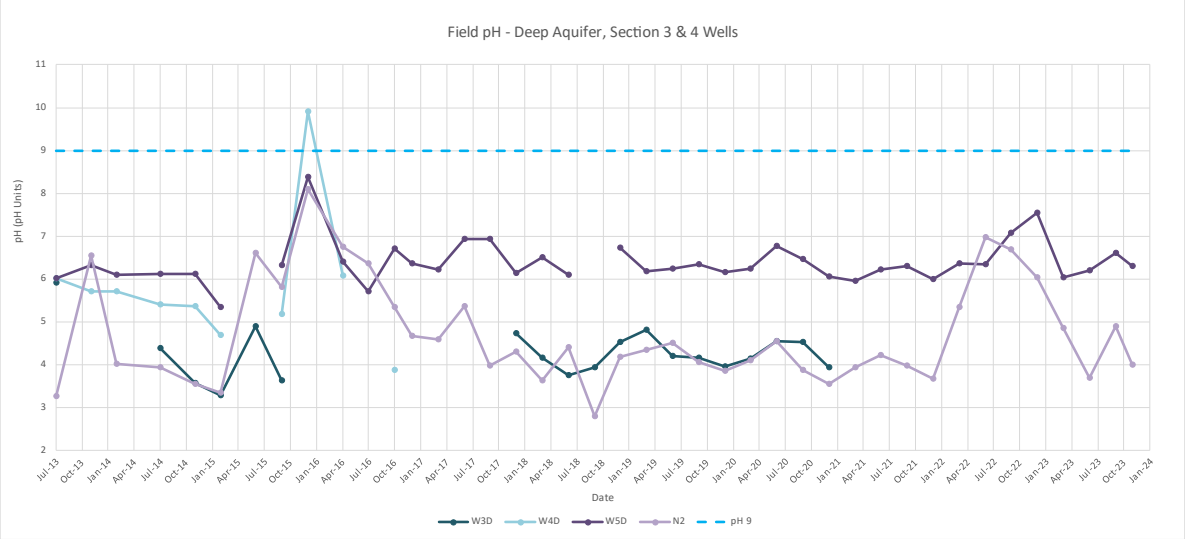


Figure 6-18: Field pH Values – Deep Aquifer, Section 3 & 4 Wells

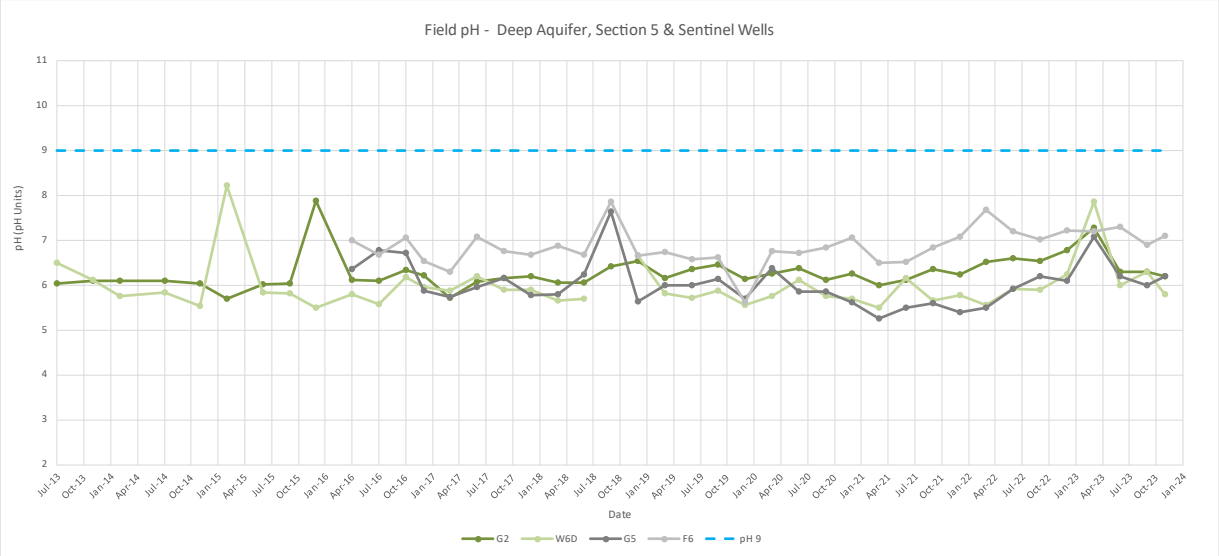


Figure 6-19: Field pH Values – Deep Aquifer, Section 5 & Sentinel Wells

7.2.2.2 Mann-Kendall Trend Analysis

Data from November 2013 to November 2023 (41 sampling events) were included for the purpose of Mann-Kendall trend analysis of pH. One GME (July 2013) was excluded from the Mann Kendall Toolkit as the methodology is only valid for between four and 40 samples. A summary is provided in **Table 6-8**.

Mann-Kendall trend analysis of pH within the deep aquifer indicates increasing trends at W2D (located on Section 1), W1D (located on Section 2), G2 (located on Section 5) and F6 (sentinel well).

During 2023, increasing pH trends coincided with pH values more than the assessment criteria at one location only, W2D, which also shows leachate impact. W1D also showed an increasing trend but no characteristics of leachate impact and pH concentrations reported below assessment criteria. Further review of W1D indicates an increase from pH 6.98 in July 2013 to pH 8.92 in December 2022. pH concentrations have since decreased to pH 7.5 in November 2023 although as pH values at W1D have approached levels characteristic of leachate impact (pH >9) and the groundwater has been described as yellow/brown this increasing pH trend at W1D may be indicative of the leachate plume expanding to the east of well W2D, the most leachate-impacted well.

Table 6-9: Mann-Kendall pH Trends - Deep Aquifer

Well	Previous Trend 2013 to 2022	Current Trend 2013 to 2023	pH >Assessment Criteria[1]	Leachate Impacted[2]
Section 1				
W2D	**Increasing**	**Increasing**	**Yes**	**Yes**
E5D	Stable	No Trend	No	No
Section 2				
W1D	**Increasing**	**Increasing**	No	No
Section 3				
~~W3D~~	*Damaged*	*Damaged*	*Damaged*	*Damaged*
~~W4D~~	*Destroyed*	*Destroyed*	*Destroyed*	*Destroyed*
Section 4				
W5D	Prob. Increasing	No Trend	No	No

Well	Previous Trend 2013 to 2022	Current Trend 2013 to 2023	pH >Assessment Criteria[1]	Leachate Impacted[2]
N2	Stable	Stable	No	No
Section 5				
G2	**Increasing**	**Increasing**	No	No
W6D	Stable	No Trend	No	No
Sentinel				
G5	**Decreasing**	Stable	No	No
F6	**Increasing**	**Increasing**	No	No

[1] *pH exceeded the assessment criteria of either 95% Protection of Aquatic Ecosystems or Recreational during any GME completed in 2023.*
[2]*Groundwater generally characteristic of leachate impact i.e., pH >9, brown in colour.*

7.2.3 Soluble Fluoride

Laboratory results for soluble fluoride in the deep aquifer reported during 2023 are summarised in **Table 6-9**.

Table 6-10: Soluble Fluoride Concentrations – Deep Aquifer

CoC	Date	No. of Samples	Minimum Conc. (mg/L)	Maximum Conc. (mg/L)	No. Results Exceeding Criteria		
					Irrigation (>1 mg/L)	Stock Watering (>2 mg/L)	Rec. (>15 mg/L)
Soluble Fluoride	March 2023	9.00	0.10	1100.00	**4**	**3**	**1**
	June 2023	9.00	<0.1	930.00	**4**	**3**	**1**
	September 2023	9.00	<0.1	1100.00	**4**	**3**	**1**
	November 2023	9.00	<0.1	1100.00	**4**	**3**	**1**

During the four GMEs completed in 2023, soluble fluoride concentrations in deep groundwater exceeded the site assessment criteria for Irrigation, Stock Watering or Recreational use at up to 4 wells as follows:

- Section 1: W2D and E5D
- Section 2: W1D
- Section 4: N2

The highest soluble fluoride concentrations were consistently reported at Section 1 deep well W2D. W2D is located directly adjacent to the CWS and reports the highest soluble fluoride concentrations of all the wells.

The lateral extent of soluble fluoride in the deep aquifer throughout 2023 is presented in **Figure 6-20**.

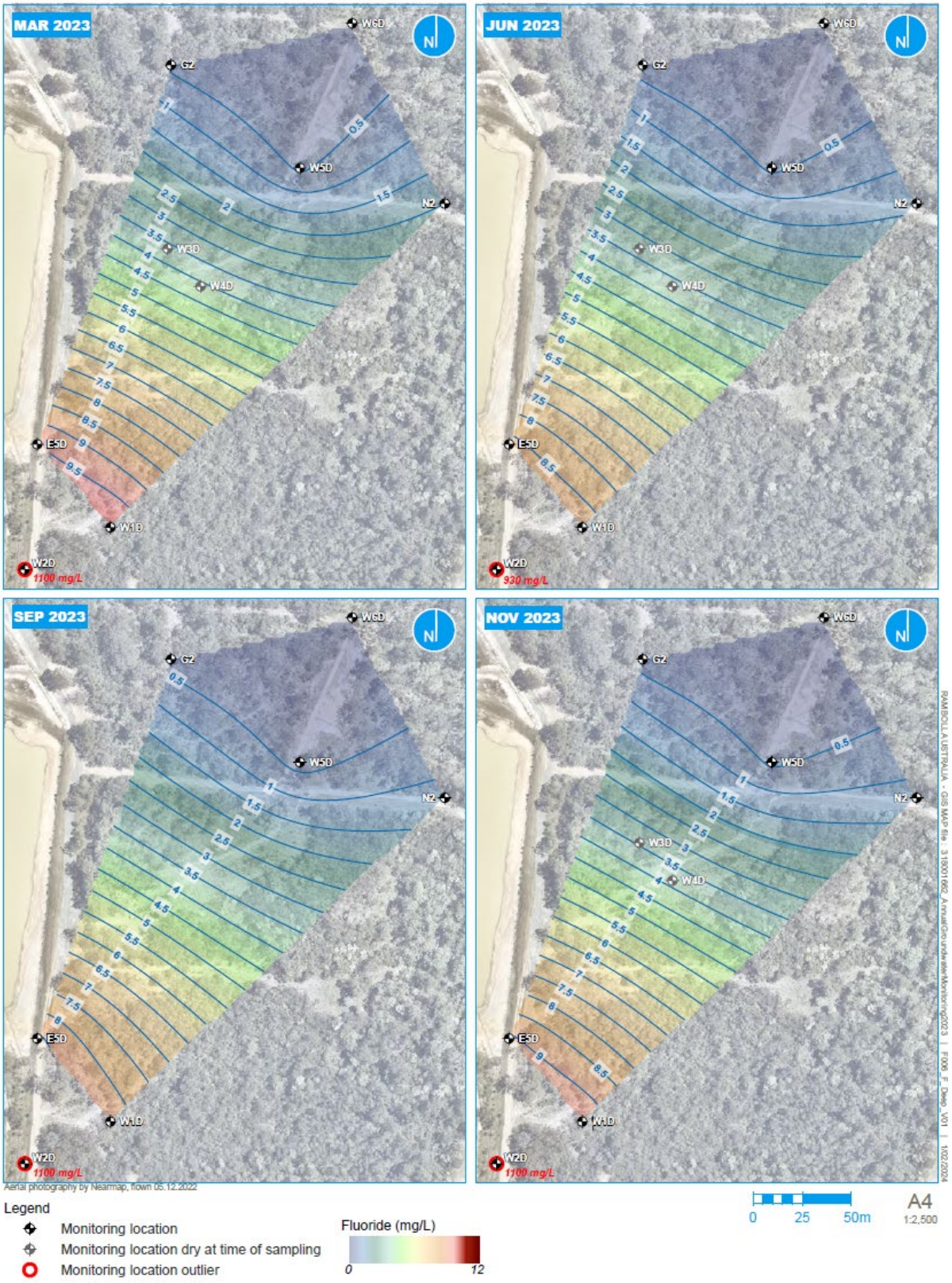


Figure 6-20: Interpolated Soluble Fluoride - Deep Aquifer 2023

7.2.3.1 Time Series Trends

Comparison of soluble fluoride concentrations within the deep aquifer for the 41 GMEs completed between July 2013 and November 2023 are shown in **Figure 6-21** to **Figure 6-24** with concentrations for W2D only, shown in **Figure 6-21**.

The time series trends show the following:

- Consistently elevated soluble fluoride concentrations at well W2D on Section 1
- Some initial fluctuations in concentrations on Section 1 to Section 5 followed by consistently lower soluble fluoride concentrations from 2017 to 2021, aside from an increase at W1D from 2020 to 2023
- Consistently low soluble fluoride concentrations in the sentinel wells.

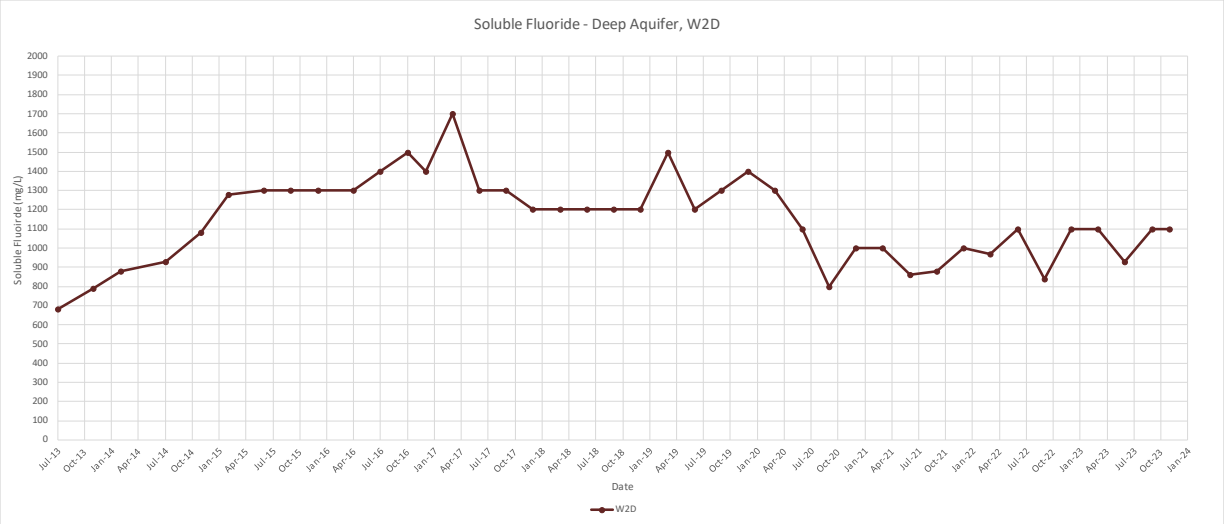


Figure 6-21: Soluble Fluoride Concentrations – Deep Aquifer, W2D

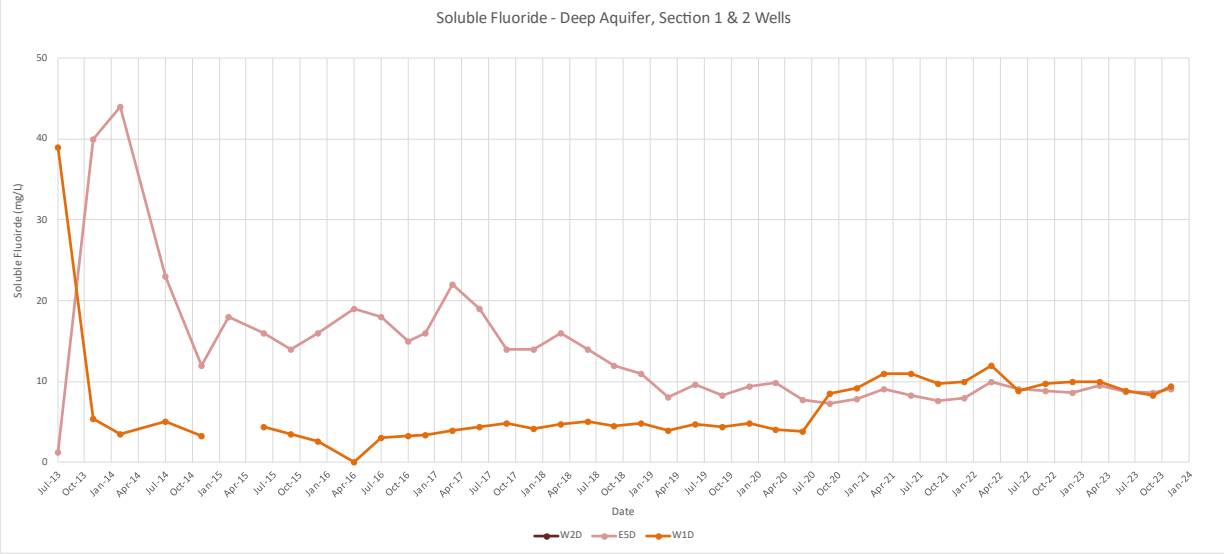


Figure 6-22: Soluble Fluoride Concentrations – Deep Aquifer, Section 1 & 2 Wells

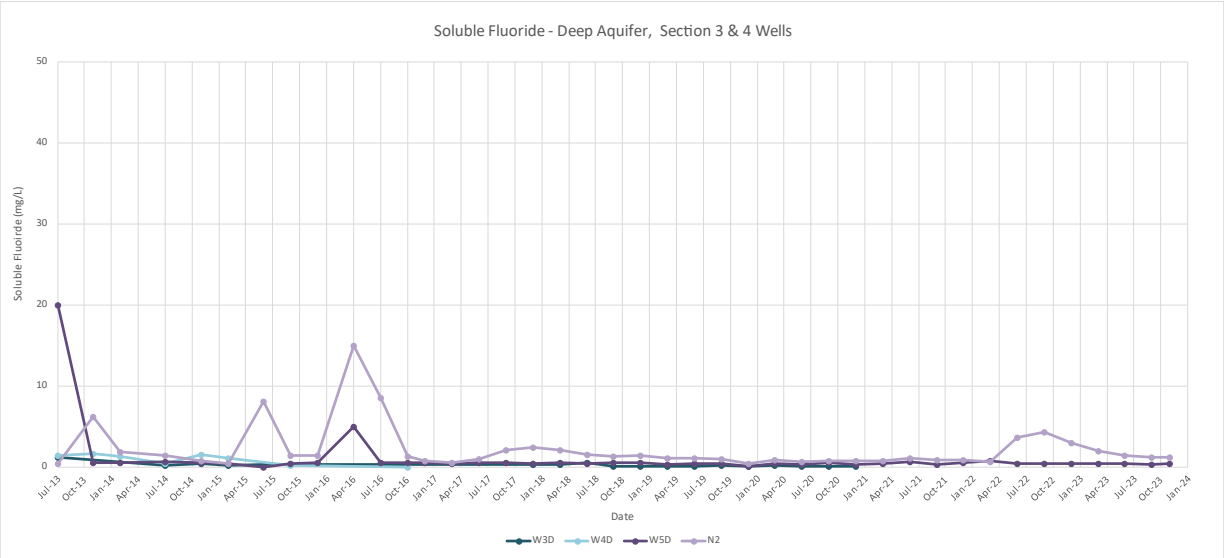


Figure 6-23: Soluble Fluoride Concentrations – Deep Aquifer, Section 3 & 4 Wells

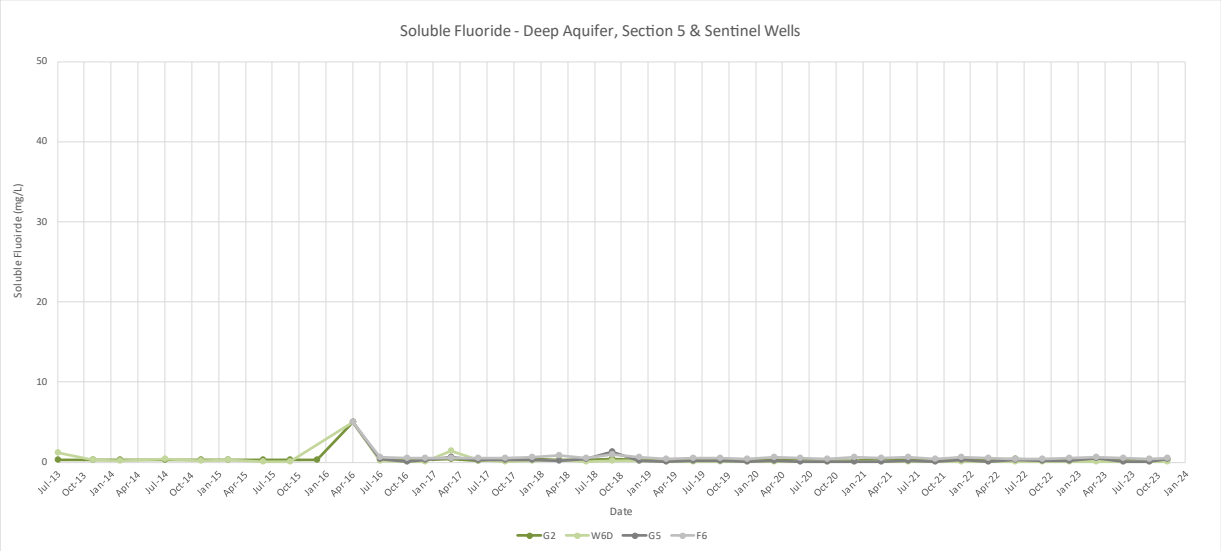


Figure 6-24: Soluble Fluoride Concentrations – Deep Aquifer, Section 5 & Sentinel Wells

7.2.3.2 Mann-Kendall Trend Analysis

Data from November 2013 to November 2023 (41 sampling events) were included for the purpose of Mann-Kendall trend analysis of soluble fluoride. One GME (July 2013) was excluded from the Mann Kendall Toolkit as the methodology is only valid for between four and 40 samples. A summary is provided in **Table 6-10**.

Mann-Kendall trend analysis of soluble fluoride indicates an increasing trend in well W1D (located on Section 2). Further review indicates that for the period of September 2020 to November 2023, fluoride concentrations at W1D have been the highest reported for this well since November 2013. The pH values at W1D are approaching levels characteristic of leachate impact (pH >9) and the groundwater has been described as yellow/brown indicating the plume may be expanding to the east of highly impacted well W2D.

Table 6-11: Mann-Kendall Soluble Fluoride Trends - Deep Aquifer

Well	Previous Trend 2013 to 2022	Current Trend 2013 to 2023	Soluble Fluoride >Assessment Criteria[1]	Leachate Impacted[2]
Section 1				
W2D	**Prob. Decreasing**	**Decreasing**	**Yes**	**Yes**
E5D	**Decreasing**	**Decreasing**	**Yes**	No
Section 2				
W1D	**Increasing**	**Increasing**	**Yes**	No
Section 3				
~~W3D~~	*Damaged*	*Damaged*	*Damaged*	*Damaged*
~~W4D~~	*Destroyed*	*Destroyed*	*Destroyed*	*Destroyed*
Section 4				
W5D	**Decreasing**	**Decreasing**	No	No
N2	No Trend	No Trend	**Yes**	No
Section 5				
G2	**Increasing**	**Prob. Increasing**	No	No
W6D	**Decreasing**	**Decreasing**	No	No
Sentinel				
G5	**Decreasing**	**Decreasing**	No	No
F6	**Decreasing**	**Decreasing**	No	No

[1]*Soluble Fluoride exceeded the assessment criteria of either 95% Protection of Aquatic Ecosystems or Recreational during any GME completed in 2023.*
[2]*Groundwater generally characteristic of leachate impact i.e., pH >9, brown in colour.*

7.2.4 Free Cyanide

Laboratory results for free cyanide in deep groundwater reported during 2023 are summarised in **Table 6-11**. Free cyanide concentrations exceeded the site ecological assessment criteria for 95% protection for aquatic ecosystems at W2D during June 2023, September 2023 and November 2023. All other wells targeting the deep aquifer reported free cyanide concentrations below the laboratory limit of reporting.

Table 6-12: Free Cyanide Concentrations – Deep Aquifer

CoC	Date	No. of Samples	Minimum Conc. (mg/L)	Maximum Conc. (mg/L)	No. Results Exceeding Criteria	
					95% Protection (>0.007 mg/L)	Recreational (>0.8 mg/L)
Free Cyanide	March 2023	9.00	<0.004	0.00	**0**	**0**
	June 2023	9.00	<0.004	0.12	**1**	**0**
	September 2023	9.00	<0.004	0.12	**1**	**0**
	November 2023	9.00	<0.004	0.15	**1**	**0**

7.2.4.1 Time Series Trends

Comparison of free cyanide concentrations at W2D for 36 GMEs completed between February 2015 and November 2023 are shown in **Figure 6-25**. Only concentrations at W2D have been graphed because all other concentrations have historically fallen below the laboratory limit of reporting. Free cyanide concentrations at W2D increased from 0.004 mg/L in December 2022 to 0.15 mg/L in November 2023.

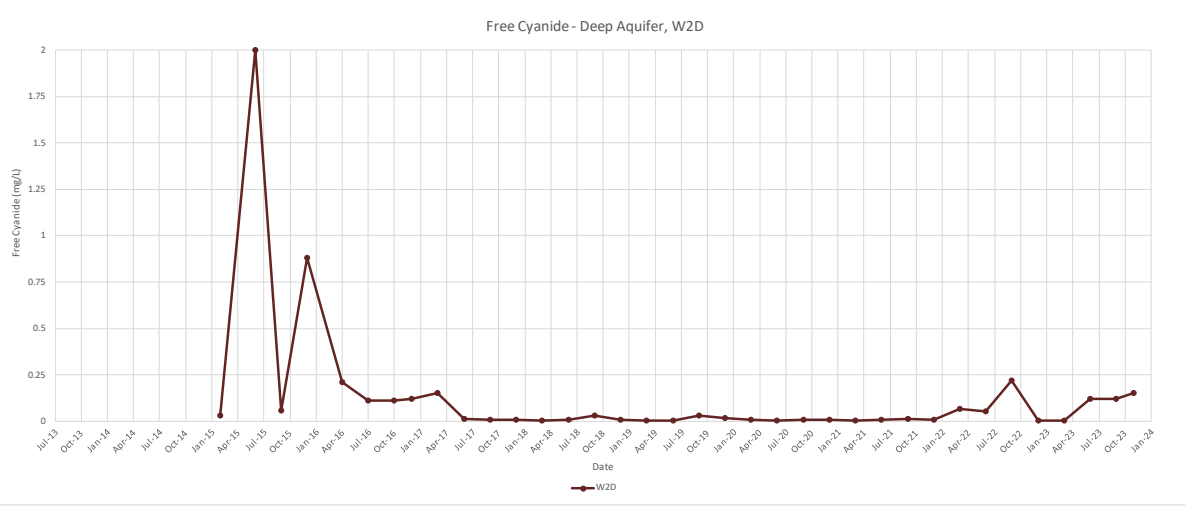


Figure 6-25: Free Cyanide Concentration – Deep Aquifer, W2D

7.2.4.2 Mann-Kendall Trend Analysis

Data from February 2015 to December 2022 (36 sampling events) were included for the purpose of Mann-Kendall trend analysis of free cyanide, a summary is provided in **Table 6-12**.

Mann-Kendall trend analysis of free cyanide in the deep aquifer shows a 'stable' trend at all wells.

Table 6-13: Mann-Kendall Trend Analysis of Free Cyanide – Deep Aquifer

Well	Previous Trend 2013 to 2022	Current Trend 2013 to 2023	Free Cyanide >Assessment Criteria[1]	Leachate Impacted[2]
Section 1				
W2D	**Decreasing**	Stable	**Yes**	**Yes**
E5D	Stable	Stable	No	No
Section 2				
W1D	Stable	Stable	No	No
Section 3				
~~W3D~~	*Damaged*	*Damaged*	*Damaged*	*Damaged*
~~W4D~~	*Destroyed*	*Destroyed*	*Destroyed*	*Destroyed*
Section 4				
W5D	Stable	Stable	No	No
N2	Stable	Stable	No	No
Section 5				
G2	Stable	Stable	No	No
W6D	Stable	Stable	No	No
Sentinel				
G5	Stable	Stable	No	No
F6	Stable	Stable	No	No

[1]*Free cyanide exceeded the assessment criteria of either 95% Protection of Aquatic Ecosystems or Recreational during any GME completed in 2023.*
[2]*Groundwater generally characteristic of leachate impact i.e., pH >9, brown in colour.*

8. UPDATED CONCEPTUAL SITE MODEL

A Conceptual Site Model (CSM) is a site-specific qualitative description of the source(s) of contamination, the pathway(s) by which a contaminant may migrate through environmental media and the populations (human and/or ecological) that may potentially be exposed. This relationship is commonly known as a Source-Pathway-Receptor (SPR) linkage. Where one or more elements of the SPR linkage are missing, the exposure pathway is incomplete, and no further assessment is required.

A CSM was developed for the CWS leachate plume based on the situation where the CWS remained intact, as reported in previous Annual Reports. This CSM has been updated as the CWS was remediated via source removal in 2023. The updated CSM is provided below.

8.1 Contaminant Sources

The contaminant source at the CWS leachate plume was the aluminium smelter wastes disposed in the CWS, primarily spent pot lining and cryolite. Contaminants of Concern associated with spent pot lining and cryolite include fluoride, cyanide, aluminium, sodium, sulphate and high pH.

The contaminant source was removed between May and November 2023. No wastes remain within the footprint of the CWS and leachate entrained within the waste was also removed as part of remedial works.

8.2 Potential Human and Ecological Receptors

Identified potential receptors of contaminants of concern, should a complete exposure pathway be present, include:

- Maintenance personnel (brush cutting is completed in this area)
- Employees of Hydro and other companies who access the buffer zone
- Vegetation growing in the area of the leachate plume
- Transitory fauna that traverse through the area of the leachate plume
- The ecology of the semi-permanent dam located adjacent to Swamp Creek, the nearest down gradient receptor
- The ecology of Swamp Creek

Limited human receptors were identified as the site is located in a portion of the buffer zone that is fenced and not accessible to the general public or Hydro employees aside from those who work in the buffer zone.

8.3 Potential Transport Mechanisms

Following remedial works at the CWS, potential transport mechanisms are now limited to migration through groundwater, with a finite volume of leachate-impacted groundwater remaining within the leachate plume. Source removal of both spent pot lining and cryolite and entrained leachate within waste in the footprint of the CWS means no source remains to generate new leachate.

Daylighting of groundwater and overland surface water flow was stopped by remediation via source removal of the CWS is 2023.

8.4 Exposure Pathways

For a receptor to be exposed to a chemical contaminant derived from a site, there must be an exposure pathway linking the source of contamination and the exposed receptor. An exposure pathway describes the course a chemical or physical agent takes from the source to the exposed receptor and generally includes the following elements (US EPA 1989):

- A source and mechanism of chemical release

- A retention or transport medium (or media where chemicals are transferred between media)
- A point of potential human contact with the contaminated media
- An exposure route (e.g., ingestion, inhalation) at the point of exposure

An evaluation of exposure pathways at the site is outlined in **Table 9-1**.

	Source-Pathway-Receptor Link? (Yes/No/Potential (P), Not Relevant (NR))						
	Maintenance Personnel	**Hydro Employees**	**Vegetation**	**Transitory fauna**	**Ecology of dam down gradient**	**Ecology of Swamp Creek**	**Justification**
Soil							
Dermal contact with impacted soil	NR	NR	NR	NR	NR	NR	Waste within the footprint of the CWS were transported to the ECC in 2023. Validation soil sampling confirms that remaining soil within the CWS footprint is not impacted.
Incidental ingestion of impacted soil	NR	NR	NR	NR	NR	NR	
Outdoor dust inhalation	NR	NR	NR	NR	NR	NR	
Surface Water							
Dermal contact with impacted surface water	NR	NR	NR	NR	NR	NR	Prior to 2014, groundwater within the leachate plume has been observed to daylight and flow across overland flow paths, providing a pathway between contaminated groundwater and human and ecological receptors. Following the installation of the interception trenches, the daylighting of groundwater has reduced in frequency and impacted surface water has been observed on few occasions during heavy rainfall since 2014. During and following remedial works in 2023, overland flow paths have been observed to be dry.
Incidental ingestion of impacted surface water	NR	NR	NR	NR	NR	NR	
Uptake of impacted surface water	NR	NR	NR	NR	NR	NR	
Groundwater							
Dermal contact with impacted groundwater	No	No	No	No	No	No	In the past, groundwater within the leachate plume has been accessible for uptake by vegetation, as evidenced by the two vegetation impact areas. Following installation of leachate interception trenches in 2014 and 2017 to remove leachate, day-lighting of leachate to overland flow paths during periods of high rainfall has slowed and surface leachate is no longer evident. Native grasses were observed to have re-colonised the southern vegetation impact area during the 2023 monitoring period.
Incidental Ingestion of impacted groundwater	No	No	No	No	No	No	
Uptake of impacted groundwater	NR	NR	P	NR	NR	NR	

Table 9-1: Source-Pathway-Receptor Linkages – Updated following Remediation of the CWS

9. CONCLUSIONS AND RECOMMENDATIONS

Ramboll has completed quarterly monitoring of a leachate plume at the former Hydro Aluminium Kurri Kurri Smelter since July 2013. The source of the leachate plume was a stockpile of aluminium smelter waste known as the Capped Waste Stockpile (CWS). The CWS was remediated via source removal and waste transfer to a newly constructed Engineered Containment Cell (ECC) between May and November 2023 as part of the ECC Construction and Site Remediation Project.

Forty-one GMEs have been completed within the leachate plume, with this Annual Report documenting the four most recent events completed in March, June, September, and November 2023.

Each GME included the sampling and analysis of groundwater from a network of 24 shallow and deep wells located on five sections along the length of the leachate plume down-gradient of the CWS. An additional pair of two shallow and deep wells were added to the network in 2016. These wells are located adjacent to Swamp Creek, the nearest surface water receptor. Physico-chemical parameters were recorded, and groundwater samples were collected and analysed for soluble fluoride, total and free cyanide as well as total and dissolved aluminium.

Evaluation of 2023 GME data has identified the following:

- Consistent with previous monitoring:
    - The leachate plume in shallow groundwater is delineated to the north, with a decreasing trend in soluble fluoride concentrations in well N9 at the leading edge of the plume.
    - The leachate plume is confined to the east due to geological constraints (high plasticity clay with low permeability). There is an increasing trend in pH and soluble fluoride in well E4 located on the eastern plume perimeter however this is not indicative of contaminant migration in this direction due to the aquifer extent.
    - The leachate plume has impacted the deeper sand aquifer in a localised area close to the plume source, the CWS, as shown by elevated soluble fluoride concentrations and a high pH in well W2D.
    - The leachate plume is not reaching the nearest surface water receptor of Swamp Creek, as indicated by continued low pH and low soluble fluoride concentrations in sentinel wells.
- There may be some expansion of leachate impact in the deep aquifer to the east, from the source towards W1D, with an increasing trend identified for both pH and soluble fluoride concentrations for three consecutive years (2021 to 2023). pH values at W1D are approaching levels characteristic of leachate impact (pH >9).
- Following CWS removal (source) it is anticipated that concentrations of contaminants will reduce with time. In the absence of risks to human health and terrestrial and aquifer ecology as reported in Environ (2013) and the proposed commercial/industrial land use, no further remediation is proposed.

This Annual Groundwater Monitoring Report is currently prepared to comply with Special Condition E1 in Hydro's Environmental Protection License (EPL) 1548, which indicates:

E1 Groundwater interception and monitoring – Capped Waste Stockpile

E1.1 The licensee is to continue operating the groundwater interception trench and leachate management system for the Capped Waste Stockpile

E1.2 the licensee is to continue the groundwater monitoring program in accordance with the 'Groundwater Water Monitoring Program, Capped Waste Stockpile' plan as provided to the EPA on 15 April 2024

E1.3 The licensee must submit a groundwater monitoring report to the EPA with each Annual Return. This report must include, but need not be limited to:

d) Aquifer characterisation, including aquifer behaviour
e) A trend analysis of monitored parameters in key wells, and
f) Any recommendations arising from a review of groundwater data

As the CWS was remediated in 2023, post-remediation monitoring will commence in 2024 as per Ramboll (2018) Remedial Action Plan, Hydro Aluminium Smelter Kurri Kurri. Post-remediation monitoring will include bi-monthly groundwater monitoring events commencing in February 2024. Trend analysis will be completed by utilising 2022 and 2023 data in conjunction with post-remediation data. A post-remediation monitoring report is to be prepared once stable or decreasing trends are achieved.

Ramboll recommend that the Special Conditions in Hydro's EPL be updated to reflect the current status of the CWS (remediation complete) and that post-remediation monitoring has commenced, as follows:

- Remove Special Condition E1.1 based on the recommendations in **Section 3.4**
- Update Special Condition E1.2 to reflect that Hydro has moved to post-remediation monitoring on a bi-monthly basis for 2024 and 2025 following source removal of the CWS, as per Ramboll (2018) Remedial Action Plan, Hydro Aluminium Smelter Kurri Kurri
- Update Special Condition E1.3 to indicate that Leachate Plume Validation Report should be submitted to the EPA at the completion of post-remediation monitoring to close out remediation of the CWS and associated leachate plume.

10. REFERENCES

ANZG (2018) Guidelines for Fresh and Marine Water Quality

ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality

ENVIRON (March 2013) Tier 2 Ecological Risk Assessment, Kurri Kurri Aluminium Smelter

ENVIRON (February 2015) Groundwater Fate and Transport Modelling, Leachate Plume – Capped Waste Stockpile, Hydro Aluminium Smelter Kurri Kurri, NSW

ENVIRON (June 2016) Hydro Aluminium Kurri Kurri Smelter, Capped Waste Stockpile, 12 Month Groundwater Monitoring Report

ENVIRON (September 2016) Plume Delineation Report, Capped Waste Stockpile

GSI (2012) Groundwater Services Inc., GSI Mann-Kendall Toolkit for Constituent Trend Analysis, Version 1.0, November 2012

NHMRC (2008) Guidelines for Managing Risks in Recreational Water

NSW DEC (2007) Guidelines for the Assessment and Management of Groundwater Contamination

Ramboll (April 2016) Hydro Aluminium Smelter, Capped Waste Stockpile, 2015 Annual Groundwater Monitoring Report

APPENDIX 1
FIGURES

Aerial photography by Nearmap, flown 05.12.2022

Legend

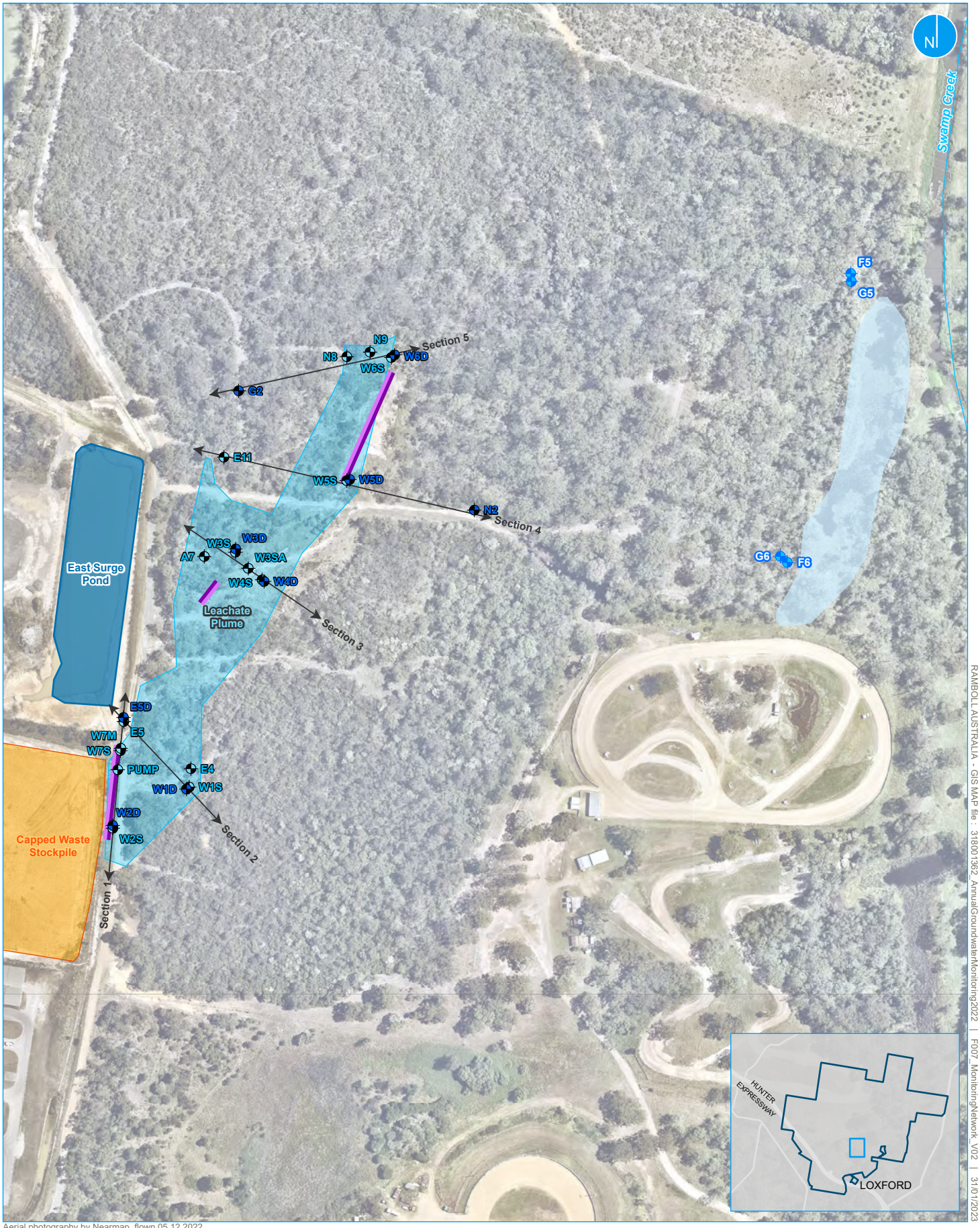
- Leachate Plume
- Capped Waste Stockpile
- East Surge Pond
- Watercourse (NSWSS)
- Waterbody (NSWSS)

0 50 100m

A4
1:5,000

RAMBOLL AUSTRALIA - GIS MAP file : 318001362_AnnualGroundwaterMonitoring2022 | F008_SiteLocationPlan_V01 | 2/02/2023

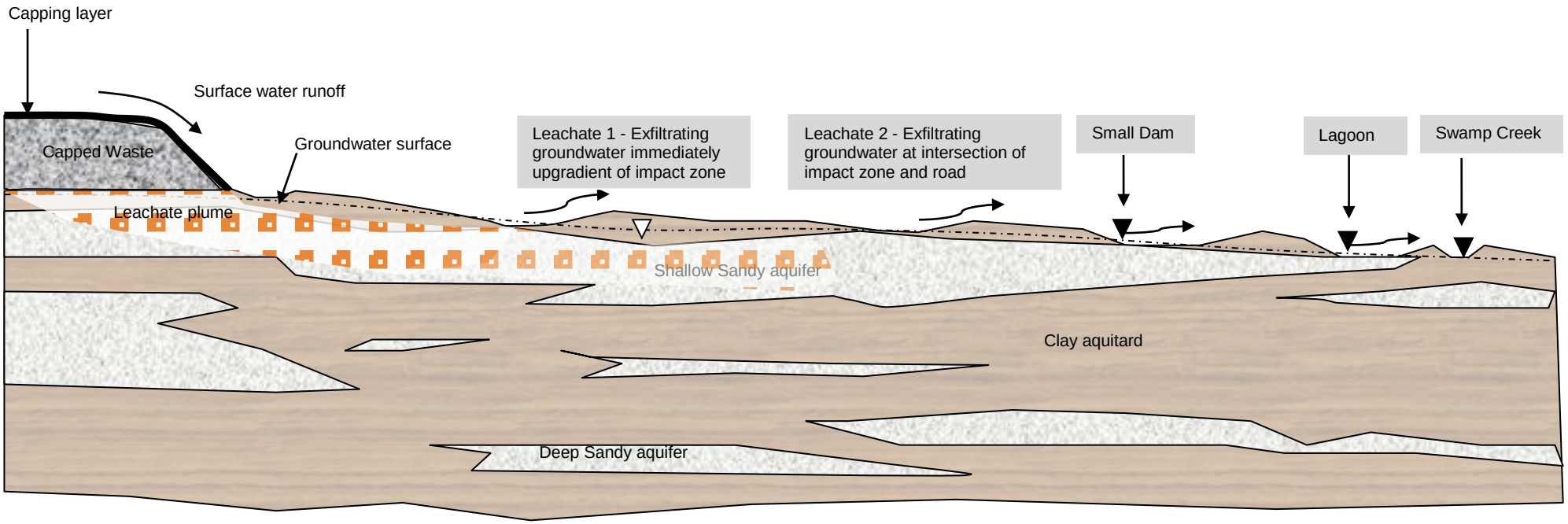
Figure 1 | AEC 1: Site Location Plan, 2022 Annual Groundwater Monitoring Report

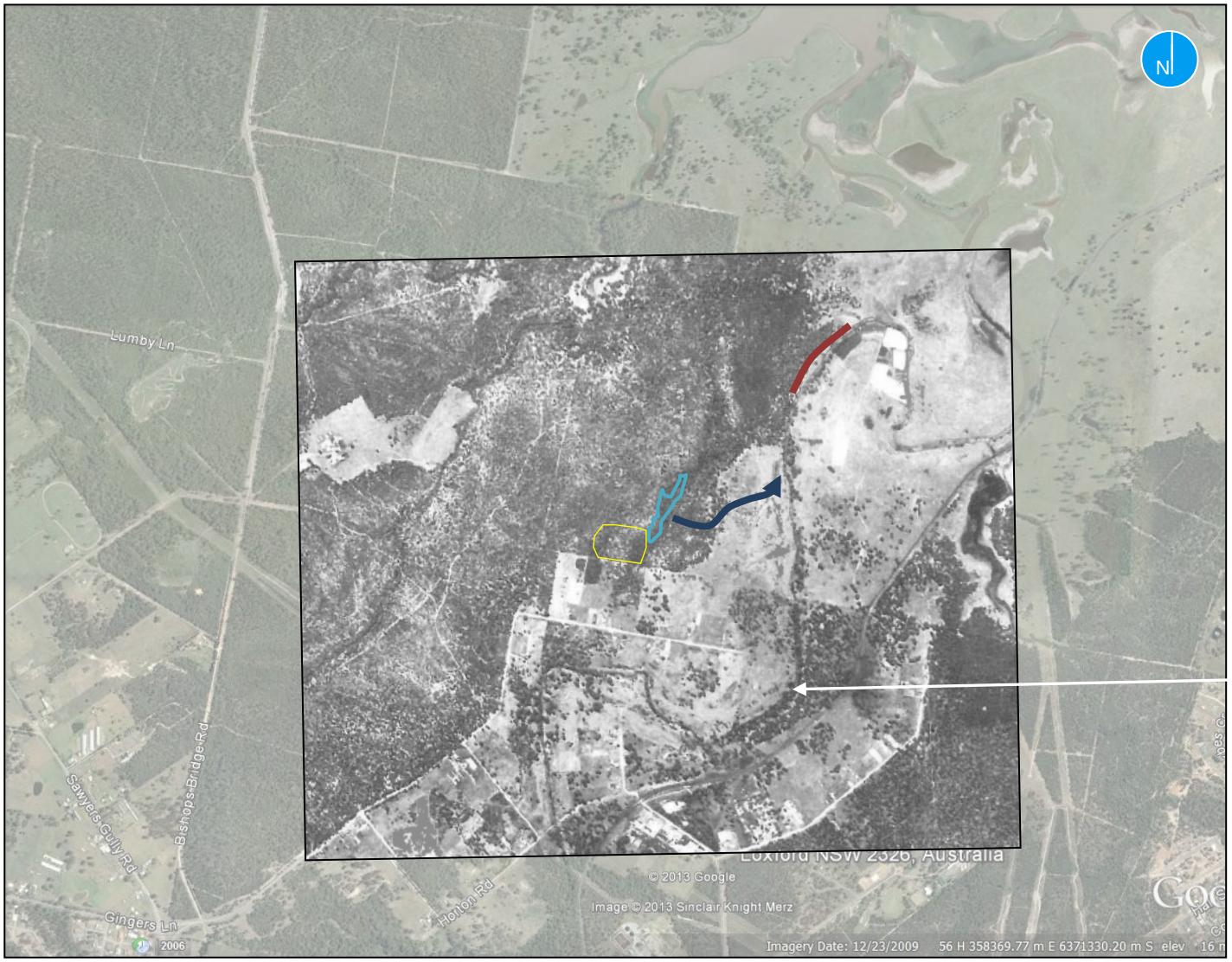


RAMBOLL AUSTRALIA - GIS MAP file - 318001362_AnnualGroundwaterMonitoring2022 | F007_MonitoringNetwork_V02 | 31/01/2023

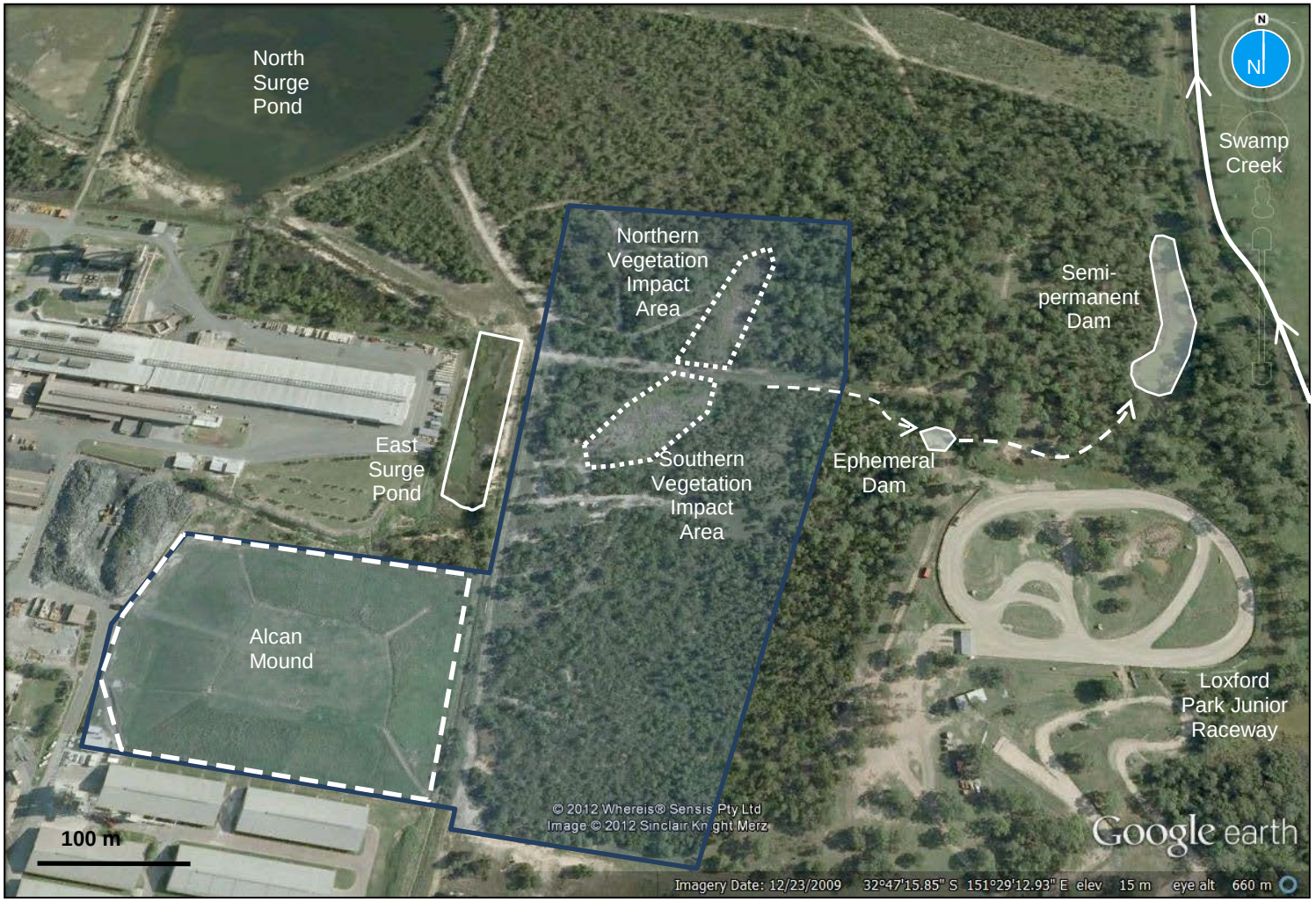
Figure 2 | Groundwater Monitoring Well Network, 2022 Annual Groundwater Monitoring Report

APPENDIX 2
ATTACHMENTS



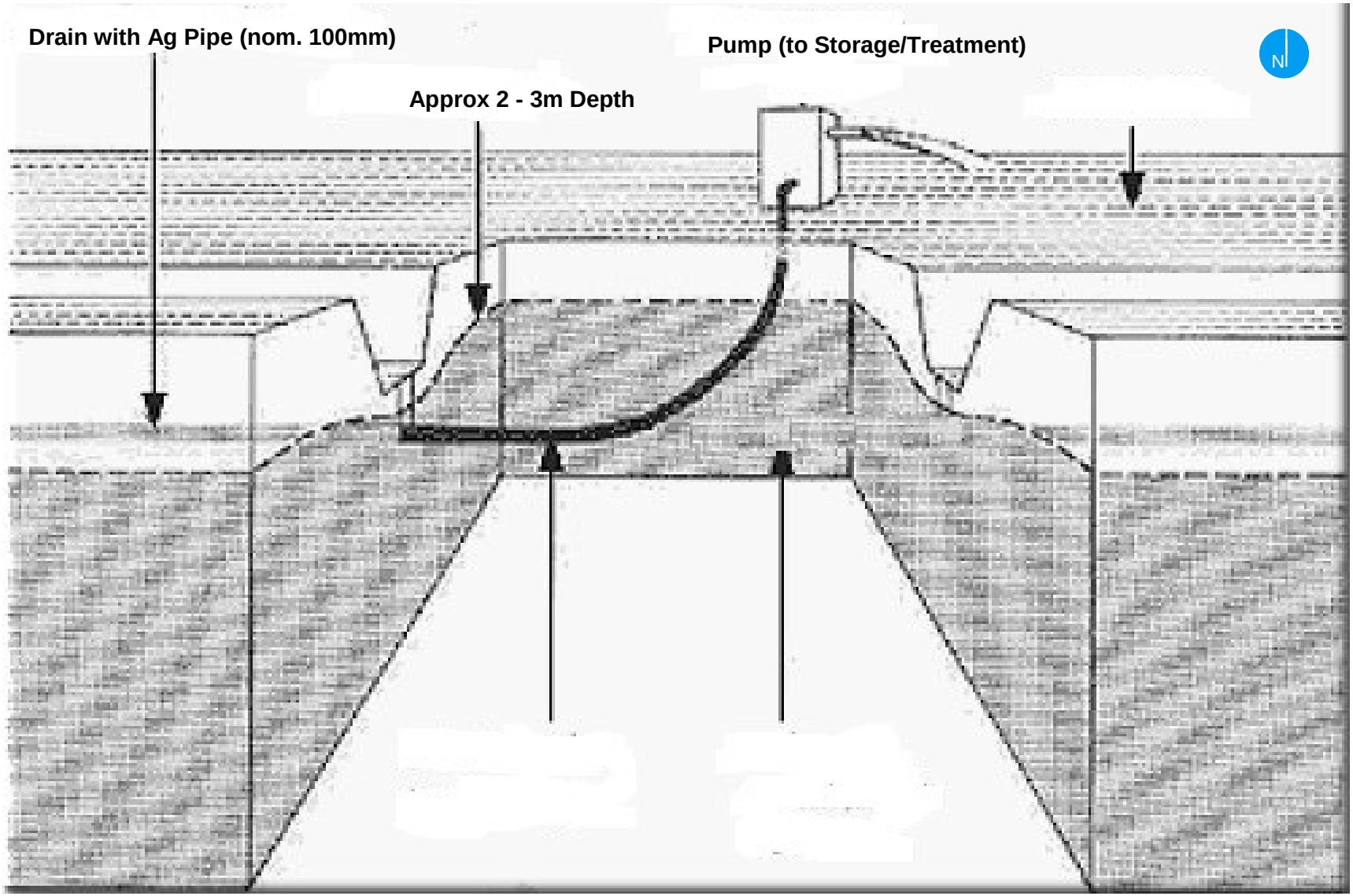


RAMBOLL AUSTRALIA - GIS MAP file : 318000664 - 2019 Annual Groundwater Monitoring Report - Attachment 2



13

Topographic Contours mAHD (based on 1m Lidar)



APPENDIX 3
2013-2022 GME HISTORICAL DATA

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table i: Results
Shallow Aquifer, Section 1

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18
					Sample ID:		W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		12.489	12.619	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
					Sample Description:		Light brown	Clear	Dry	Dry	Dry	Dry	Turbid, brown, purged dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	7.33	6.82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soluble Fluoride		1	2	1.5		mg/L	0.1	*115*	*58*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Free Cyanide	0.007			0.8		mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Cyanide						mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	***91.5***	***33***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (dissolved)						mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table i: Results
Shallow Aquifer, Section 1

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:						Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:						Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:						Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23	Jun-23	Sep-23
Sample ID:						W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S
Project Name:						Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:						Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:						Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
Aquifer:						Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):						12.139						13.289	12.379	12.049	11.999	12.289	-	12.849	12.839	12.659	12.699	12.109	12.209	-	-
Sample Description:						Clear, no odour	Dry	Dry	Dry	Dry	Dry	Clear, turbid	Turbid, pale yellow, no odour	Turbid, light brown, no odour	Turbid, light brown, no odour	Slightly turbid, pale yellow/grey, no odour	Insufficient water to sample	Turbid, pale yellow brown, no odour	Very pale brown, slight sulphidic odour. Very turbid	Turbid, pale yellow grey, no odour	Clear, colourless, no odour	Very turbid, pale brown, no odour	Very turbid, orange brown, no odour	Dry	Dry
Analyte grouping/Analyte					**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	7.47	-	-	-	-	-	6.74	6.73	6.97	7.19	7.32	-		6.51	6.77	7.02	7.17	8.49	-	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	*92*	-	-	-	-	-	*20*	*20*	*66*	*72*	*57*	-	*24*	*37*	*25*	*29*	*53*	-	-	-
Free Cyanide	0.007			0.8	mg/L	0.004	0.01	-	-	-	-	-	<0.004	<0.004	0.008	<0.004	0.005	-	<0.004	< 0.004	< 0.004	< 0.004	< 0.004	-	-	-
Total Cyanide					mg/L	0.004	3.9	-	-	-	-	-	0.17	0.48	1.8	1.5	0.44	-	0.061	0.27	0.14	0.23	1.4	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	***37***	-	-	-	-	-	***18***	***19***	***31***	***43***	**6.9**	-	***9.6***	***17***	***28***	***7.6***	***63***	-	-	-
Aluminium (dissolved)					mg/L	0.01	***11***	-	-	-	-	-	***9.6***	**7.2**	**5.2**	**5.20**	4.50	-	4.20	12	24	7	1.9	-	-	-

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
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Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table i: Results
Shallow Aquifer, Section 1

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Nov-23	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	14/April/2017	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18
					Sample ID:		W2S	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		-	12.214	12.054	11.804	-	-	-	11.904	11.614	-	11.724	-	-	-	-	-	-	-	-	-
					Sample Description:		Dry	Brown	Brown	Brown	Dry	Dry	Dry	Brown	Brown	Dry	Brown	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	-	*9.54*	*9.37*	*9.78*	-	-	-	*9.14*	*9.42*	-	*9.48*	-	-	-	-	-	-	-	-
Soluble Fluoride		1	2	1.5		mg/L	0.1	-	*495*	*410*	*450*	-	-	-	*410*	*350*	-	*330*	-	-	-	-	-	-	-	-
Free Cyanide	0.007			0.8		mg/L	0.004	-	-	-	-	-	-	-	*<0.8*	-	-	-	-	-	-	-	-	-	-	-
Total Cyanide						mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	-	0.33	0.52	2.5	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-
Aluminium (dissolved)						mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table i: Results
Shallow Aquifer, Section 1

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23	Jun-23
					Sample ID:		E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		-	-	-	-	-	-	-	12.054	12.184	11.914	11.714	12.134	11.864	12.304	12.564	12.534	12.564	12.024	12.134	11.854
					Sample Description:		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Slightly red/brown	Clear, yellow/brown, no odour	Clear to slightly turbid, brown, no odour	Slightly turbid, pale brown, no odour	Clear, dark brown, no odour	Clear, yellow brown, no odour	Clear, dark brown, no odour	Dark brown, no odour	Clear, dark yellow brown, no odour	Clear, dark yellow brown, no odour	Clear, dark yellow brown, sulphidic odour	Clear, dark yellow to brown, no odour	Insufficient water to sample
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	-	-	-	-	-	-	-	8.79	*9.11*	*9.2*	8.89	*9.15*	*9.36*	*9.16*	*9.27*	*9.63*	*9.84*	*10.19*	*9.28*	-
Soluble Fluoride		1	2	1.5		mg/L	0.1	-	-	-	-	-	-	-	*220*	*250*	*300*	*300*	*310*	*230*	*320*	*360*	*410*	*360*	*420*	*380*	-
Free Cyanide	0.007			0.8		mg/L	0.004	-	-	-	-	-	-	-	0.007	0.011	0.01	<0.004	0.011	0.011	0.013	0.3	< 0.004	< 0.004	0.006	0.012	-
Total Cyanide						mg/L	0.004	-	-	-	-	-	-	-	62	57	79	54	50	18	19	56	68	82	86	97	-
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	-	-	-	-	-	-	-	0.9	1	3.6	**9**	0.49	0.75	1.6	0.31	0.52	0.15	0.3	*0.24*	-
Aluminium (dissolved)						mg/L	0.01	-	-	-	-	-	-	-	0.08	0.07	0.12	0.13	0.08	0.10	0.09	0.09	0.09	0.09	0.08	0.06	-

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

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Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table i: Results
Shallow Aquifer, Section 1

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:					Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:					Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:					Sep-23	Nov-23	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18		
Sample ID:					E5	E5	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP		
Project Name:					Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:					Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:					Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
Aquifer:					Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):					11.624	-	12.487	12.352	11.862	11.042	11.312	11.262	11.952	11.702	11.652	11.932	11.842	11.842	11.662	11.542	11.742	11.572	11.412	11.302		
Sample Description:					Insufficient water to sample	Dry	Light brown	Light brown, cloudy	Brown, murky, light brown	Brown, no odour	Brown, turbid, some odour	Light brown, no odour	Light brown	Very turbid, brown	-	Brown, turbid	Very turbid, brown	-	Milky	Brown	Brown	Milky brown	Brown	Turbid, brown		
Analyte grouping/Analyte					**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	-	-	7.45	7.24	*9.65*	*10.14*	*10.01*	*9.95*	*9.87*	*10.22*	*10.27*	*10.13*	*10.22*	*9.98*	*9.72*	*9.56*	*9.2*	*9.9*	*9.6*	*9.73*
Soluble Fluoride		1	2	1.5	mg/L	0.1	-	-	*79*	*51*	*280*	*550*	*930*	*740*	*200*	*680*	*360*	*570*	*280*	*85*	*88*	*210*	*60*	*180*	*160*	*220*
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	-	-	0.021	<0.08	0.029	0.1	0.01	0.018	<0.004	0.006	0.006	<0.004	<0.005	0.009	<0.004
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	-	***58.1***	***60***	***17***	-	***310***	***370***	***120***	***610***	***97***	***280***	***93***	***90***	***120***	***740***	***39***	***160***	***45***	***82***
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
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Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
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Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table i: Results
Shallow Aquifer, Section 1

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:						Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:						Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:						Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23
Sample ID:						PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP
Project Name:						Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:						Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:						Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
Aquifer:						Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):						11.772	11.572	11.522	11.422	11.502	11.432	11.302	11.662	13.362	12.422	12.402	12.152	12.602	12.212	12.852	13.0220	12.9420	12.9020	12.1920	-
Sample Description:						Light brown, no odour	Light brown/grey, hydrogen sulfide odour	Clear to slightly brown, no odour	Slightly brown, slight sulphidic odour	Slightly turbid, clear, no odour	Brown/grey, sulphidic odour	Turbid, slightly brown	Yellow/brown, turbid	Clear, no odour	Turbid, yellow, no odour	Slightly turbid, light brown, no odour	Turbid, pale black/grey/brown, strong odour	Slightly turbid, some flocculants, pale grey, no odour	Slightly turbid, pale grey, no odour	Clear, colourless, no odour	Brown, no odour	Clear to slightly turbid, pale yellow, no odour	Slightly turbid, pale yellow brown, no odour	Turbid, yellow brown, sulphidic odour	Well destroyed
Analyte grouping/Analyte					**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	*9.17*	*13.68*	*9.55*	*9.42*	*9.43*	*9.89*	*9.93*	7.2	*9.59*	7.4	6.88	7.9	6.61	8.32	6.91	7.37	9.56	9.78	10.45	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	*62*		*250*	*370*	*140*	*400*	*530*	*30*	*17*	*21*	*22*	*24*	*17*	*26*	*17*	*19*	*130*	*150*	*360*	-
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	0.01	0.009	<0.004	<0.004	0.014	0.007	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	0.012	< 0.004	-
Total Cyanide					mg/L	0.004	4.1	44	14	21	9.8	35	57	0.31	0.009	0.077	0.23	0.23	0.056	0.068	0.012	0.035	4.8	8.4	27	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	***46***	***23***	**5.4**	***9.3***	***38***	***93***	***77***	***49***	3.2	**6.1**	***12***	***23***	***12***	***18***	4.1	9	2.8	11	8.5	-
Aluminium (dissolved)					mg/L	0.01	0.09	0.46	1.9	1.3	4.3	0.86	2.9	***17***	0.44	0.76	1.9	***15.00***	**6.40**	***11.00***	2.10	2.3	0.6	2.2	0.95	-

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

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Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table i: Results
Shallow Aquifer, Section 1

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Jun-23	Sep-23	Nov-23	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17
					Sample ID:		PUMP	PUMP	PUMP	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		-	-	-	12.614	12.969	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
					Sample Description:		Well destroyed	Well destroyed	Well destroyed	Cloudy/turbid	Light brown, cloudy sediment	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Purge dry	Dry
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	-	-	-	7.29	7.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	-	-	-	*34*	*31*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	-	-	***415***	***42***	-	***210***	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table i: Results
Shallow Aquifer, Section 1

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22
					Sample ID:		W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		-	-	-	-	-	-	-	-	-	13.019	12.369	-	-	12.229	11.979	12.219	12.7990	12.7890	12.7890	-
					Sample Description:		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Clear, no odour	Turbid, yellow/brown, no odour	Dry	Dry	Very turbid, pale brown, no odour	Dry	Very turbid, pale brown, no odour	Pale brown, no odour	Turbid, pale yellow grey, no odour	Turbid, pale yellow brown, no odour	Insufficiemt water to sample
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	-	-	-	-	-	-	-	-	-	8.08	7.61	-	-	7.24	-	7.01	6.95	7.38	7.13	-
Soluble Fluoride		1	2	1.5		mg/L	0.1	-	-	-	-	-	-	-	-	-	*17*	*22*	-	-	*24*	-	*33*	*27*	*16*	*18*	-
Free Cyanide	0.007			0.8		mg/L	0.004	-	-	-	-	-	-	-	-	-	<0.004	<0.004	-	-	<0.004	-	<0.004	< 0.004	< 0.004	< 0.004	-
Total Cyanide						mg/L	0.004	-	-	-	-	-	-	-	-	-	0.08	1.1	-	-	1.2	-	1	0.51	0.21	0.2	-
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	-	-	-	-	-	-	-	-	-	**5.9**	***65***	-	-	***410***	-	***86***	***32***	***7.5***	***3.6***	**-**
Aluminium (dissolved)						mg/L	0.01	-	-	-	-	-	-	-	-	-	2.1	0.55	-	-	***20***	-	***9.1***	***23***	***2.9***	***1.9***	**-**

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table i: Results
Shallow Aquifer, Section 1

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:					Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:					Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:					Mar-23	Jun-23	Sep-23	Nov-23	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	
Sample ID:					W7S	W7S	W7S	W7S	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	
Project Name:					Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:					Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:					Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	
Aquifer:					Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	
SWL (m AHD):					-	-	-	-	12.218	12.138	11.568	10.958	11.088	10.918	11.938	11.608	11.518	11.668	11.578	11.568	11.388	11.278	11.458	11.298	
Sample Description:					Dry	Dry	Dry	Dry	Light brown	Brown	Brown, dark, sulphur smell	Brown, no odour	Brown, turbid, some odour	Brown/copper, strong odour	Brown	Brown	-	Brown	-	Brown	-	Brown	Brown	Brown	
Analyte grouping/Analyte						**Units**	**LOR**																		
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	-	-	-	-	*9.81*	*9.87*	*10.1*	*10.12*	*9.78*	*9.44*	*9.82*	*9.91*	*9.7*	*9.99*	*9.95*	*10.17*	*9.68*	*9.61*	*10.1*	*9.8*
Soluble Fluoride		1	2	1.5	mg/L	0.1	-	-	-	-	*878*	*650*	*730*	-	*910*	*840*	*810*	*670*	*540*	*640*	*870*	*1100*	*1000*	*220*	*750*	*760*
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	-	-	-		0.02	***<2***	***<0.4***	*0.21*	0.013	0.072	-	0.007	0.09	0.007	0.005
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	-	-	-	***11.4***	2.3	***45***		***21***	0.99	***32***	**8.7**	**7.8**	4.4	0.08	**6.2**	***11***	3.4	1.3	1.2
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table i: Results
Shallow Aquifer, Section 1

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:						Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:						Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:						Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22
Sample ID:						W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M
Project Name:						Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:						Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:						Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
Aquifer:						Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):						11.128	11.018	11.478	11.298	11.268	11.138	11.228	11.158	11.068	11.348	12.148	12.188	11.858	11.698	12.128	11.848	12.518	12.728	12.538	12.708
Sample Description:						Tea brown	Tea brown	Turbid, light brown, no odour	Turbid, brown, no odour	Slightly brown, slight odour	Slightly brown	Brown, no odour	Brown/red, slightly sulphidic odour	Slightly brown	Slightly red/brown, no odour	Clear, no odour	Clear to slightly turbid, brown, no odour	Slightly turbid, brown, no odour	Slightly turbid, dark brown, strong odour	Slightly turbid, dark brown, no odour	Clear, dark yellow, no odour	Slightly turbid, pale yellow brown, no odour	Dark yellow brown, no odour	Clear, dark brown, no odour	Turbid, pale yellow brown, no odour
Analyte grouping/Analyte					**Units**	**LOR**																			
pH (field)	6.5-8[¤]			6.5-8.5	pH units	-	*9.6*	*9.61*	*9.7*	*13.24*	*9.63*	*9.68*	*9.65*	*9.73*	*9.75*	*9.67*	*8.97*	*9.1*	*9.28*	*9.47*	*9.86*	*9.42*	*9.44*	*9.29*	*10.39*	*10.16*
Soluble Fluoride		1	2	1.5	mg/L	0.1	*780*	*770*	*810*	*860*	*820*	*990*	*750*	*800*	*830*	*810*	*440*	*290*	*580*	*630*	*490*	*350*	*360*	*400*	*710*	*480*
Free Cyanide	0.007			0.8	mg/L	0.004	0.006	<0.004	0.008	0.017	0.007	0.006	<0.004	0.006	0.009	0.006	<0.004	0.019	0.009	0.005	0.006	0.013	0.008	0.03	0.029	0.12
Total Cyanide					mg/L	0.004	-	140	190	160	130	150	130	160	160	130	34	28	30	75	48	25	16	29	99	110
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	3.6	***10***	0.76	**6.6**	0.31	**7.5**	1.5	2	***10***	0.74	2.8	***11***	***11***	2.1	**8.1**	2.3	**6.8**	4.2	3.6	2.4
Aluminium (dissolved)					mg/L	0.01	-	-	0.16	0.14	0.22	0.28	0.30	0.30	0.27	0.39	0.83	2.60	0.76	0.35	0.51	0.36	0.37	0.75	0.37	0.3

Blank Cell indicates no criterion available

[¤] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table i: Results
Shallow Aquifer, Section 1

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational							
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Dec-22	Mar-23	Jun-23	Sep-23	Nov-23
					Sample ID:		W7M	W7M	W7M	W7M	W7M
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 1	Section 1	Section 1	Section 1	Section 1
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		11.968	12.098	11.858	11.448	11.068
					Sample Description:		Turbid, dark yellow brown, no odour	Clear, brown, no odour	Clear, brown, sulphidic odour	Clear, brown, no odour	Insufficient water for sampling
Analyte grouping/Analyte						**Units**	**LOR**					
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	*10.81*	*9.3*	*10.4*	*10.4*	-
Soluble Fluoride		1	2	1.5		mg/L	0.1	*850*	*680*	*560*	*670*	-
Free Cyanide	0.007			0.8		mg/L	0.004	< 0.004	< 0.004	0.06	< 0.004	-
Total Cyanide						mg/L	0.004	170	150	150	100	-
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	3.4	*8.3*	*9.9*	*3.2*	-
Aluminium (dissolved)						mg/L	0.01	0.25	*0.29*	0.2	*0.26*	-

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table ii: Results
Shallow Aquifer, Section 2

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18
Sample ID:							W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							11.887	11.977	11.367	11.277	-	11.217	11.527	11.207	11.317	11.297	-	-	-	-	-	-	-	-	-
Sample Description:							Brown	Brown	Brown, cloudy, sulphur odour	Dark brown	Dry	Brown, no odour	Dark brown, turbid	Brown		Brown	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Analyte grouping/Analyte					**Units**	**LOR**																			
pH (field)	6.5-8[¤]			6.5-8.5	pH units	-	7.22	7.17	6.84	6.9	-	6.66	6.83	6.86	-	7.21	-	-	-	-	-	-	-	-	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	*53*	*69*	*42*	-	-	*66*	*120*	*38*	-	*39*	-	-	-	-	-	-	-	-	-
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	0.004	*<4*	-	-	-	-	-	-	-	-	-	-	-	-
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	***121***	***130***	***27***	-	-	***120***	***1200***	-	-	***15***	-	-	-	-	-	-	-	-	-
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
[¤] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table ii: Results
Shallow Aquifer, Section 2

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23	Jun-23
Sample ID:							W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							-	-	-	-	-	-	-	10.857	11.487	11.077	11.377	11.417	11.297	11.477	11.657	11.867	12.027	11.627	11.627	11.297
Sample Description:							Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Turbid, yellow, no odour	Red/brown, sulphidic odour	Turbid, yellow brown, no odour	Turbid, dark yellow, no odour	Turbid, yellow brown, no odour	Turbid, yellow brown, no odour	Dark yellow brown, no odour	Clear, dark yellow, no odour	Slightly turbid, dark yellow, no odour	Slightly turbid, yellow, slight sulphidic odour	Slightly turbid, dark yellow, no odour	Cloudy yellow, no odour
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[¤]			6.5-8.5	pH units	-	-	-	-	-	-	-	-	-	-	7.89	8.24	7.55	7.99	8.11	7.61	7.48	8.6	8.1	7.98	7.45	8
Soluble Fluoride		1	2	1.5	mg/L	0.1	-	-	-	-	-	-	-	-	*17*	*17*	*17*	**14**	**14**	**13**	**13**	**9.8**	**10**	**12**	**10**	**8.8**
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	-	-	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	0.71	0.7	0.44	0.45	0.18	0.35	0.72	1.4	1	1.2	1.4	1.1
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	-	-	-	-	-	-	-	3.2	**7**	**7.6**	***56***	4.7	2.1	1.1	1.5	2.3	0.28	*0.58*	*75*
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	0.3	0.14	0.12	0.22	0.11	0.07	0.18	< 0.01	0.11	0.08	0.05	0.07

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[¤] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table ii: Results
Shallow Aquifer, Section 2

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Sep-23	Nov-23	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18
Sample ID:							W1S	W1S	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							11.077	11.087	11.93	12.09	10.33	11.51	11.28	11.31	12.07	11.65	11.5	11.44	11.39	11.38	11.11	11.11	-	11.01	10.81	10.83
Sample Description:							Insufficient water for sampling	Insufficient water for sampling	Brown	Brown, sulphur smell	Brown	Dark brown, no odour	Strong sulphur odour, dark brown	Brown/orange, no odour	Brown	Dark brown, turbid		Brown	Brown	Turbid, brown	Tea colour	Tea brown	Dry	Milky brown	Dark brown	Brown
Analyte grouping/Analyte					**Units**	**LOR**																				
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	-	-	*9.91*	*9.79*	*9.94*	*9.84*	*9.4*	8.84	*9.46*	*9.62*	*10.57*	*9.73*	*9.83*	*9.94*	*9.53*	*9.53*	-	*9.59*	*9.46*	*9.32*
Soluble Fluoride		1	2	1.5	mg/L	0.1	-	-	*699*	*650*	*650*	*590*	*380*	*340*	*260*	*280*	*300*	*330*	*570*	*550*	*450*	*670*	-	*380*	*380*	*410*
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	-	-	<0.004	<0.4	<0.04	0.032	0.004	0.049	0.045	<0.004	0.029	-	0.008	<0.004	<0.004
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	61
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	-	0.379	0.89	0.4	3.2	***35***	***46***	***49***	***53***	***18***	***14***	***9.9***	2.6	***36***	***12***	-	***32***	***37***	***37***
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
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Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table ii: Results
Shallow Aquifer, Section 2

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23
Sample ID:							E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							11.33	11.12	11.06	10.84	11	9.94	10.77	11.4	11.03	11.93	11.65	12.64	11.92	11.61	12.31	12.19	12.19	12.22	11.69	11.82
Sample Description:							Brown/orange, strong hydrogen sulfide odour	Turbid, slightly brown/yellow	Slightly brown, no odour	Slightly brown, slight sulphidic odour	Slightly yellow, sulphidic odour	Brown, sulphidic odour	Clear to slightly grey	Yellow/brown	Red/brown, no odour	Clear to slightly turbid, orange/brown, slight	Brown/red, easy to filter	Clear, brown, slight odour	Turbid, brown, no odour	Very turbid, dark brown, no odour	Slightly turbid, yellow brown, sulphidic odour	Dark yellow brown, sulphidic odour	Clear to slightly turbid, yellow brown, no odour	Clear, dark brown, slight sulphidic odour	Clear, dark yellow brown, slight sulphidic odour	Clear, dark brown,no odour

Analyte grouping/Analyte					**Units**	**LOR**																			
pH (field)	6.5-8[¤]			6.5-8.5	pH units	-	*9.62*	*9.29*	*9.27*	*9.47*	*9.56*	*9.58*	*9.67*	*9.65*	*9.73*	*9.87*	*10.64*	*9.56*	*9.91*	*10.1*	*9.89*	*9.82*	*10.28*	*10.45*	*10.7*	*9.65*
Soluble Fluoride		1	2	1.5	mg/L	0.1	*350*	*380*	*410*	*530*	*490*	*530*	*590*	*560*	*690*	*560*	*680*	*610*	*760*	*570*	*680*	*710*	*820*	*660*	*780*	*740*
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	<0.004	0.006	<0.004	<0.004	<0.004	0.006	0.004	<0.004	<0.004	<0.004	0.008	0.006	0.008	0.008	< 0.004	0.029	0.2	0.004	0.011
Total Cyanide					mg/L	0.004	69	41	48	57	74	130	130	110	160	190	1.8	89	120	47	81	140	180	220	210	200
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	***13***	***22***	1.7	**5.2**	1.3	0.98	1.8	***14***	0.5	0.55	0.44	0.65	***9.4***	***70***	0.49	0.41	0.82	0.38	***0.39***	*0.26*
Aluminium (dissolved)					mg/L	0.01	1	0.42	0.8	1.1	0.25	0.83	0.45	0.79	0.36	0.46	0.28	0.38	0.45	0.53	0.29	0.36	0.42	0.35	0.38	*0.23*

Blank Cell indicates no criterion available
[¤] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
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Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table ii: Results
Shallow Aquifer, Section 2

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational				
					Sample Type:	Groundwater	Groundwater	Groundwater
					Laboratory:	Envirolab	Envirolab	Envirolab
					Sample date:	Jun-23	Sep-23	Nov-23
					Sample ID:	E4	E4	E4
					Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:	Section 2	Section 2	Section 2
					Aquifer:	Shallow	Shallow	Shallow
					SWL (m AHD):	11.24	11.29	11.02
					Sample Description:	Clear, dark brown, sulphidic odour	Clear, pale brown yellow, no odour	-

Analyte grouping/Analyte					**Units**	**LOR**			
pH (field)	6.5-8[¤]			6.5-8.5	pH units	-	*10.2*	*10.2*	*9.8*
Soluble Fluoride		1	2	1.5	mg/L	0.1	*600*	*710*	*760*
Free Cyanide	0.007			0.8	mg/L	0.004	0.068	< 0.004	0.21
Total Cyanide					mg/L	0.004	210	170	170
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	*0.55*	*2.4*	*11*
Aluminium (dissolved)					mg/L	0.01	*0.32*	*0.3*	*0.26*

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Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table iii: Results
Shallow Aquifer, Section 3

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18
Sample ID:							A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							10.279	10.599	9.809	10.059	9.919	10.019	10.489	10.219	10.009	9.999	9.939	9.859	9.699	9.799	9.969	9.669	9.579	9.629	9.999	9.819
Sample Description:							Brown	Brown	Brown	Brown, strong organic material odour	Brown/orange, slightly turbid, slight odour	Dark orange/brown, no odour	Brown	Brown	-	Brown	Brown	Turbid, brown	Brown	Tea brown	Tea brown	Tea brown, foul smell	Tea brown, smelly	Tea brown	Dark brown/orange, very strong hydrogen sulfide odour	Slightly brown/yellow, 'rotten egg' odour
Analyte grouping/Analyte					**Units**	**LOR**																				
pH (field)	6.5-8[¤]			6.5-8.5	pH units	-	*9.63*	*9.47*	*9.67*	*9.66*	*9.24*	8.56	*9.45*	*9.8*	*10.71*	*9.75*	*9.37*	*9.57*	*9.15*	*9.12*	*9.49*	2.65	*9.27*	8.96	*9.36*	*9.75*
Soluble Fluoride		1	2	1.5	mg/L	0.1	*436*	*420*	*410*	*380*	*410*	*550*	*500*	*400*	*320*	*330*	*320*	*360*	*380*	*500*	*400*	*390*	*400*	*190*	*390*	*450*
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	*11*	*<2*	<0.020	*0.19*	<0.004	0.026	0.032	<0.004	0.039	<0.004	<0.005	<0.004	<0.004	0.007	0.009
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	87	80
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.208	4.7	0.7	0.26	0.71	1.7	2.7	0.61	0.72	***14***	2.9	2.1	3	***25***	3.7	***5.9***	4.1	***8.9***	***24***	4.4
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.37	0.2

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Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table iii: Results
Shallow Aquifer, Section 3

	95% Protection of Aquatic Ecosystems	**Irrigation**	**Stock Watering**	**Recreational**	**Sample Type:**	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23	Jun-23	Sep-23
					Sample ID:	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7
					Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3
					Aquifer:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):	9.989	9.609	9.689	9.819	9.569	10.029	10.149	10.369	10.259	10.969	10.419	10.249	10.649	10.729	10.629	10.719	10.299	10.179	9.909	8.069
					Sample Description:	Brown, sulphidic odour	Slightly brown, sulphidic odour	Slightly brown, sulphidic odour	Brown sulphidic odour	Slightly red/brown, sulphidic odour	Slightly red/brown, sulphidic odour	Slightly brown, sulphidic odour	Clear, brow, strong 'rotten eggs' odour	Red/brown, strong odour	Clear, brown, strong odour	Clear to slightly turbid, dark yellow/brown, slight odour	Slightly turbid, dark brown, strong odour	Clear to slightly turbid, dark brown, sulphidic	Dark yellow brown, strong sulphidic odour	Clear, yellow brown, no odour	Clear, dark yellow brown, strong sulphidic odour	Clear, dark yellow brown. No odour	Turbid, dark brown, no odour	Clear, brown yellow, no odour	Insufficient water to sample

Analyte grouping/Analyte					**Units**	**LOR**																			
pH (field)	6.5-8▫			6.5-8.5	pH units	-	*9.06*	*9.38*	*9.4*	*9.39*	*9.48*	*9.46*	*9.4*	*9.6*	*9.85*	*9.26*	*9.36*	*9.73*	*9.46*	*9.5*	*9.78*	*9.98*	*10.2*	*9.15*	*9.9*	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	*410*	*600*	*480*	*480*	*520*	*410*	*470*	*370*	*500*	*380*	*110*	*370*	*360*	*330*	*330*	*300*	*340*	*350*	*300*	-
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	0.004	<0.004	<0.004	<0.004	<0.004	0.005	<0.004	0.005	<0.004	< 0.004	0.009	0.014	0.005	< 0.004	0.005	-
Total Cyanide					mg/L	0.004	54	100	82	88	90	64	86	81	1.8	43	9.2	20	18	45	41	60	55	70	78	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	1	0.44	0.5	0.4	0.33	0.46	0.37	0.4	0.87	0.31	0.16	1	0.28	0.2	0.23	0.22	0.15	0.24	0.21	-
Aluminium (dissolved)					mg/L	0.01	0.25	0.19	0.16	0.21	0.28	0.25	0.21	0.22	0.23	0.21	0.11	0.23	0.15	0.16	0.18	0.17	0.14	0.12	0.18	-

Blank Cell indicates no criterion available
▫ Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table iii: Results
Shallow Aquifer, Section 3

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Nov-23	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18
Sample ID:							A7	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							8.089	-	10.312	9.282	9.832	9.552	9.902	10.292	10.052	9.632	9.622	9.762	9.602	7.182	9.702	9.902	8.982	8.912	9.582	9.872
Sample Description:							Insufficient water to sample	Light brown	Brown	Light brown	Clear to brown, no odour	Brown/orange, no odour	Brown/orange, no odour	Brown	Light brown, slightly turbid	-	Brown	Turbid, brown	Turbid, brown	Brown	-	Tea brown	Brown	Purge dry	Milky brown	Turbid, brown
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8▫			6.5-8.5		pH units	-	-	8.53	8.82	7.61	8.89	7.68	6.38	7.53	7.53		7.46	7.02	7.01	6.4	7.4	7.66	7	6.99	7.19	6.91
Soluble Fluoride		1	2	1.5		mg/L	0.1	-	*237*	*310*	*210*	*270*	*210*	*250*	*230*	*200*	*160*	*190*	*170*	*150*	*110*	*180*	*62*	*99*	-	*180*	*120*
Free Cyanide	0.007			0.8		mg/L	0.004	-	-	-	-	-	-	<0.004	*<0.4*	<0.02	0.023	0.007	0.005	0.014	<0.004	0.007	<0.004	<0.005	-	<0.004	0.007
Total Cyanide						mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	24
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	-	***11.7***	2.6	**7.1**	***9.2***	**5.3**	***34***	4.4	***24***	***92***	***15***	**6.9**	***21***	***90***	***48***	***15***	***110***	-	***80***	***16***
Aluminium (dissolved)						mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3

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Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table iii: Results
Shallow Aquifer, Section 3

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23	Jun-23
Sample ID:							W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							9.522	9.902	-	9.122	9.752	-	9.872	10.022	9.952	9.702	10.242	10.082	9.772	10.182	10.132	10.202	10.182	9.712	10.102	9.542
Sample Description:							Turbid, brown, no odour	Slightly brown, no odour	Turbid, pale brown, silty	Clear to yellow, slightly turbid, cloudy	Slightly brown	Insufficient water for sampling	Slightly brown/red	Clear, slightly red/brown	Clear to slightly turbid, brown, no odour	Red/brown, no odour	Turbid, yellow/brown, no odour	Clear to slightly turbid, yellow brown, no odour	Slightly turbid, dark yellow brown, slight odour	Clear, dark yellow brown, no odour	Pale brown, no odour	Turbid, yellow brown, no odour	Clear, yellow, no odour	Clear, dark yellow, no odour	Slightly turbid, dark yellow to brown, no odour	Clear, dark brown, no odour
Analyte grouping/Analyte					**Units**	**LOR**																				
pH (field)	6.5-8[¤]			6.5-8.5	pH units	-	7.14	6.8	-	7.01	7.7	-	7.21	7.29	7.28	7.59	7.14	7.57	7.53	7.58	8.21	8.96	9.3	8.3	7.97	8.2
Soluble Fluoride		1	2	1.5	mg/L	0.1	*96*	*100*	-	*90*	*170*	-	*150*	*150*	*97*	*100*	*130*	*130*	*110*	*230*	*290*	*300*	*240*	*180*	*200*	*130*
Free Cyanide	0.007			0.8	mg/L	0.004	0.004	0.008	-	<0.004	0.013	-	0.016	0.005	0.011	<0.004	0.028	0.016	<0.004	0.033	< 0.004	0.009	< 0.004	0.006	0.008	0.005
Total Cyanide					mg/L	0.004	14	15	-	15	20	-	26	18	9.3	14	13	17	12	14	26	27	25	28	30	33
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	***23***	***21***	-	***33***	3.8	-	***26***	3.1	**8.2**	***29***	**8.7**	4	3.1	0.73	4.7	3.3	2.1	3.7	*2.2*	*1.2*
Aluminium (dissolved)					mg/L	0.01	1.1	3.2	-	3.3	0.79	-	4.1	1.2	4.4	3.5	2.5	0.58	0.62	0.3	0.31	0.26	0.26	0.37	*0.3*	*0.26*

Blank Cell indicates no criterion available
¤ Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
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Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table iii: Results
Shallow Aquifer, Section 3

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Sep-23	Nov-23	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18
Sample ID:							W3S	W3S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							9.352	9.192	-	9.934	-	-	-	-	9.739	9.729	-	-	9.719	-	-	-	-	-	-	-
Sample Description:							Cloudy, brown yellow, no odour	Clear, yellow brown, no odour	Dry	Brown	Dry	Dry	Dry	Dry	Brown	Dark brown	Dry	Dry	Slightly turbid, brown	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Analyte grouping/Analyte					**Units**	**LOR**																				
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	8.3	8.4	-	*9.13*	-	-	-	-	*9.13*	*9.07*	-	-	5.11	-	-	-	-	-	-	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	*140*	*180*	-	*480*	-	-	-	-	*490*	*400*	-	-	-	-	-	-	-	-	-	-
Free Cyanide	0.007			0.8	mg/L	0.004	0.018	0.29	-	-	-	-	-	-	*<4*	*<40*	-	-	-	-	-	-	-	-	-	-
Total Cyanide					mg/L	0.004	110	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	*7.2*	*7.7*	-	3.6	-	-	-	-	2.3	***13***	-	-	-	-	-	-	-	-	-	-
Aluminium (dissolved)					mg/L	0.01	*0.23*	*0.34*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
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Concentration in red font exceed Irrigation criteria value
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Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table iii: Results
Shallow Aquifer, Section 3

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:						Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:						Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:						Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23
Sample ID:						W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S
Project Name:						Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:						Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:						Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3
Aquifer:						Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):						9.759	-	-	-	-	-	-	9.599	10.029		10.629	9.789	9.739	-	-	-	-	-	-	-
Sample Description:						Dark brown, orange odour	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Slightly red/brown	Purge dry	Dry, mud at base of well	Very turbid, brown, organic odour	Very turbid, grey/black/brown, organic odour	Insufficient water to sample	Insufficient water to sample	Insufficient water to sample	Insufficient water to sample	Insufficient water to sample	Insufficient water to sample	Insufficient water to sample
Analyte grouping/Analyte					**Units**	**LOR**																			
pH (field)	6.5-8[¤]			6.5-8.5	pH units	-	8.26	-	-	-	-	-	-	-	8.32	-	-	7.58	7.91	-	-	-	-	-	-	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	*160*	-	-	-	-	-	-	-	*76*	-	-	*81*	*120*	-	-	-	-	-	-	-
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	-	-	-	-	-	-	-	<0.004	-	-	<0.004	<0.004	-	-	-	-	-	-	-
Total Cyanide					mg/L	0.004	12	-	-	-	-	-	-	-	2.1	-	-	2.2	1.7	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	***71***	-	-	-	-	-	-	-	***19***	-	-	***63***	***170***	-	-	-	-	-	-	-
Aluminium (dissolved)					mg/L	0.01	0.38	-	-	-	-	-	-	-	5.4	-	-	***24***	2.3	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
¤ Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table iii: Results
Shallow Aquifer, Section 3

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational				
					Sample Type:	Groundwater	Groundwater	Groundwater
					Laboratory:	Envirolab	Envirolab	Envirolab
					Sample date:	Jun-23	Sep-23	Nov-23
					Sample ID:	W4S	W4S	W4S
					Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:	Section 3	Section 3	Section 3
					Aquifer:	Shallow	Shallow	Shallow
					SWL (m AHD):	-	-	-
					Sample Description:	Dry	Dry	Dry

Analyte grouping/Analyte					**Units**	**LOR**			
pH (field)	6.5-8[¤]			6.5-8.5	pH units	-	-	-	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	-	-	-
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-
Total Cyanide					mg/L	0.004	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	-	-
Aluminium (dissolved)					mg/L	0.01	-	-	-

Blank Cell indicates no criterion available
[¤] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table iv: Results
Shallow Aquifer, Section 4

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18
Sample ID:							E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							8.06	7.735	7.48	7.72	7.67	7.54	8.7	8.15	7.9	7.94	7.64	7.55	7.41	7.4	7.56	7.33	7.2	7.11	7.56	7.4
Sample Description:							Clear/light brown	Cloudy, brown	Light brown	Brown, slightly turbid, sulphidic odour	Dark grey, turbid, no odour	Brown/orange, slight sulphidic odour	Brown	-	-	Clear to light brown, turbid	Turbid, brown	Turbid, brown	Grey	Brown	Brown	Milky	Brown	Yellow	Light brown, hydrogen sulfide odour	Slightly brown
Analyte grouping/Analyte					**Units**	**LOR**																				
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	*9.36*	*9.36*	*9.33*	*9.41*	*9.32*	8.86	7.97	*9.23*	8.65	*9.2*	*9.29*	*9.41*	*9.1*	8.7	*9.07*	3.51	8.83	8.62	*9.02*	*10.45*
Soluble Fluoride		1	2	1.5	mg/L	0.1	*102*	*160*	*190*	*160*	*150*	*230*	***7.4***	*110*	*96*	*120*	*120*	*130*	*200*	*230*	*99*	*130*	*110*	*120*	*120*	*130*
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	0.005	<0.004	<0.004	0.033	<0.004	0.009	0.016	0.004	0.015	<0.004	<0.005	<0.004	<0.004	<0.004	<0.004
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.4	10	8
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	***23***	***23***	4	**7.8**	3.6	5	2.5	***11***	2.7	**7.6**	***23***	***22***	***15***	***89***	**5.6**	***120***	***49***	4.4	4.9	***9.3***
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03	0.02

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table iv: Results
Shallow Aquifer, Section 4

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23	Jun-23	Sep-23
Sample ID:							E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							7.46	7.25	7.29	7.34	7.18	7.65	7.68	7.97	7.86	7.76	8.1	7.88	8.45	8.55	8.49	8.63	8.1	7.88	7.62	7.27
Sample Description:							Clear, no odour	-	Clear, sulphidic odour	Clear, slightly turbid	Clear, sulphidic odour	-	Clear, slight sulphidic odour	Clear, yellow/brown, no odour	Clear to slightly turbid, light brown, no odour	Low turbid, pale yellow, strong odour	Very turbid	Turbid, pale yellow brown, slight odour	Turbid, pale brown, no odour	Pale yellow brown, no odour	Turbid, pale yellow grey, no odour	Clear to slightly turbid, colourless to pale brown,	Turbid, brown yellow, slight sulphidic odour	Slightly turbid, pale yellow, no odour	Clear, colourless, no odour	Unable to be sample
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	7.7	8.99	8.76	7.87	8.95	8.41	8.48	8.69	*9.24*	8.3	*9.21*	*9.48*	7.09	6.88	7.37	6.91	8.8	8.16	*8.9*	-
Soluble Fluoride		1	2	1.5		mg/L	0.1	*49*	*150*	*74*	*41*	*120*	*41*	*54*	*53*	*78*	*74*	*120*	*76*	**12**	**8.3**	**11**	**7.9**	*23*	*19*	*27*	-
Free Cyanide	0.007			0.8		mg/L	0.004	<0.004	0.004	<0.004	<0.004	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	-
Total Cyanide						mg/L	0.004	0.65	18	3.8	0.3	20	0.79	1.9	3.5	5.1	1.9	3.1	1.4	0.17	0.2	0.93	0.21	0.5	0.53	0.47	-
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	**6.4**	***11***	1.8	3.9	1.5	3.3	2.4	2.6	**5.3**	1.1	***50***	5	4.8	3.3	1.8	1.8	1.1	*1.1*	*2.2*	-
Aluminium (dissolved)						mg/L	0.01	0.1	0.06	0.04	0.03	0.03	0.07	0.06	0.12	0.08	0.05	0.23	0.09	2	2.1	0.59	1	0.47	*0.21*	0.18	-

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table iv: Results
Shallow Aquifer, Section 4

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																						
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Nov-23	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18
Sample ID:							E11	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							-	9.188	9.273	-	9.053	-	8.993	9.323	9.293	-	-	9.063	-	-	-	-	-	-	-	-
Sample Description:							Dry	Light brown	Light brown, cloudy	Dry	Brown, turbid, no odour	Dry	Brown/orange, no odour	Brown	Brown	Dry	Dry	-	Dry	Dry	Dry	Brown	Dry	Dry	Dry	Dry
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	-	7.37	7.37	-	7.39	-	6.55	7.26	7.2	-	-	7.29	-	-	-	7.79	-	-	-	-
Soluble Fluoride		1	2	1.5		mg/L	0.1	-	*35*	*61*	-	*100*	-	*93*	*88*	*70*	-	-	*62*	-	-	-	*50*	-	-	-	-
Free Cyanide	0.007			0.8		mg/L	0.004	-	-	-	-	-	-	<0.004	*<4*	<0.02	-	-	-	-	-	-	<0.004	-	-	-	-
Total Cyanide						mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	-	***13***	***13***	-	***15***	-	***22***	**7**	***31***	-	-	***10***	-	-	-	**6.2**	-	-	-	-
Aluminium (dissolved)						mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
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Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table iv: Results
Shallow Aquifer, Section 4

	95% Protection of Aquatic Ecosystems	**Irrigation**	**Stock Watering**	**Recreational**	**Sample Type:**		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23	Jun-23	
					Sample ID:		W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	
					SWL (m AHD):		-	-	-	-	-	-	8.843	9.173	9.093	-	8.973	-	-	9.073	-	-	-	-	-	-	
					Sample Description:		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Clear, yellow, no odour	Slightly turbid, yellow/orange / brown, no odour	Dry	Very turbid, brown, no odour	Dry	Dry	Very turbid, grey brown, no odour	Dry	Dry	Dry	Dry	Dry	Dry	
Analyte grouping/Analyte						**Units**	**LOR**																				
pH (field)	6.5-8[¤]			6.5-8.5		pH units	-	-	-	-	-	-	-	-	7.76	7.47	-	7.2	-	-	6.74	-	-	-	-	-	-
Soluble Fluoride		1	2	1.5		mg/L	0.1	-	-	-	-	-	-	-	*34*	*34*	-	*39*	-	-	*24*	-	-	-	-	-	-
Free Cyanide	0.007			0.8		mg/L	0.004	-	-	-	-	-	-	-	<0.004	<0.004	-	<0.004	-	-	<0.004	-	-	-	-	-	-
Total Cyanide						mg/L	0.004	-	-	-	-	-	-	-	2.6	2.2	-	2.5	-	-	0.34	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	-	-	-	-	-	-	-	**11**	**23**	-	***42***	-	-	***32***	-	-	-	-	-	-
Aluminium (dissolved)						mg/L	0.01	-	-	-	-	-	-	-	**6.6**	2.6	-	5	-	-	***14***	-	-	-	-	-	-

Blank Cell indicates no criterion available

[¤] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table iv: Results
Shallow Aquifer, Section 4

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational			
Sample Type:						Groundwater	Groundwater
Laboratory:						Envirolab	Envirolab
Sample date:						Sep-23	Nov-23
Sample ID:						W5S	W5S
Project Name:						Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:						Hydro Kurri Kurri	Hydro Kurri Kurri
Section:						Section 4	Section 4
Aquifer:						Shallow	Shallow
SWL (m AHD):						-	-
Sample Description:						Dry	Dry
Analyte grouping/Analyte					**Units**	**LOR**	
pH (field)	6.5-8[¤]			6.5-8.5	pH units	-	-	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	-	-
Free Cyanide	0.007			0.8	mg/L	0.004	-	-
Total Cyanide					mg/L	0.004	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	-
Aluminium (dissolved)					mg/L	0.01	-	-

Blank Cell indicates no criterion available
[¤] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table v: Results
Shallow Aquifer, Section 5

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18
Sample ID:							N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							9.18	8.74	8.46	8.8	8.73	8.65	9.35	9.19	9.09	9.03	8.61	8.64	8.38	8.22	8.56	8.16	7.75	7.87	8.29	8.18
Sample Description:							Yellow	Clear, slightly cloudy	Light brown, sulphur odour	Clear/dark yellow, no odour	Dark grey, turbid, no odour	Orange/yellow, no odour	Brown	Slightly turbid, light brown	-	Brown, turbid	-	Turbid, brown	-	Light brown	Brown	Faint yellow	Faint brown	Brown	Light brown, some odour	Brown/yellow
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	6.36	6.38	6.48	6.53	6.39	6.11	6.49	6.69	6.74	6.59	6.63	6.92	6.4	6.54	6.78	6.76	6.67	6.45	6.71	*10.53*
Soluble Fluoride		1	2	1.5		mg/L	0.1	0.27	0.17	0.26	0.27	0.29	0.35	0.9	0.3	0.4	**<10**	0.4	0.6	0.4	1	0.4	0.4	0.4	0.4	0.5	0.4
Free Cyanide	0.007			0.8		mg/L	0.004	-	-	-	-	-	<0.004	*<0.4*	<0.02	0.005	<0.004	0.004	<0.004	<0.004	0.006	<0.004	<0.005	<0.004	<0.004	<0.004	<0.004
Total Cyanide						mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.54	0.67	0.56
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	0.102	**12**	0.11	0.3	**91**	1.8	**29**	**5.3**	3.4	**34**	0.47	1.6	1	**34**	3.9	**25**	4	**5.1**	4.3	0.22
Aluminium (dissolved)						mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	0.03

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table v: Results
Shallow Aquifer, Section 5

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23	Jun-23	Sep-23
Sample ID:							N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							8.28	7.9	7.89	7.99	7.77	8.04	8.19	8.53	8.47	8.73	9.27	8.93	8.99	9.45	9.4	9.71	9.32	9	8.72	8.36
Sample Description:							Slightly brown, very slight sulphidic odour	Slightly brown/yellow, no odour	Clear to yellow	Turbid, brown/yellow, no odour	Slightly yellow, sulphidic odour	Clear, bright yellow, sulphidic odour	Slightly yellow/red, no odour	Turbid, yellow, no odour	Slightly turbid, brown, slight odour	Turbid, yellow/orange /brown, slight odour	Slightly turbid, yellow/brown, no odour	Turbid, yellow/orange brown, slight odour	Turbid, pale yellow brown, no odour	Yellow brown, sulphidic odour	Slightly turbid, yellow, no odour	Turbid, dark yellow, no odour	Dark yellow	Slightly turbid, dark yellow, slight sulphidic odour	Turbid, yellow brown, no odour	Cloudy, brown yellow, no odour
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	6.51	6.81	6.68	6.6	6.67	6.76	6.77	6.77	6.95	6.54	6.85	7.19	6.63	6.91	7.11	7.52	7.54	6.97	6.89	7
Soluble Fluoride		1	2	1.5		mg/L	0.1	0.4	0.4	0.4	0.4	0.2	0.4	0.4	0.4	0.4	0.5	0.6	0.5	0.5	0.5	0.5	0.6	0.6	0.5	0.6	0.4
Free Cyanide	0.007			0.8		mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Total Cyanide						mg/L	0.004	0.6	0.61	0.55	0.47	0.63	0.35	0.49	0.66	0.44	0.1	0.2	0.1	0.041	0.38	0.62	0.52	0.61	0.53	0.71	0.17
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	0.35	0.9	0.76	1.1	1.7	0.3	0.63	4.5	1	0.7	**5.1**	**6.5**	0.2	0.61	0.29	0.39	0.34	*0.91*	*4.4*	*0.92*
Aluminium (dissolved)						mg/L	0.01	0.06	0.04	0.06	0.06	0.06	0.07	0.05	0.06	0.05	0.06	0.05	0.04	0.04	0.07	0.05	0.03	0.02	0.04	0.05	0.04

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
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Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
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Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table v: Results
Shallow Aquifer, Section 5

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																						
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Nov-23	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18
Sample ID:							N8	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							8.42	9.222	9.312	8.482	9.012	8.872	9.002	9.692	9.382	9.052	8.832	9.252	-	-	9.142	9.352	8.822	8.812	9.022	9.222
Sample Description:							Slightly cloudy, yellow brown, sulphidic odour	Light brown	Cloudy brown	Dry	Dark yellow, slightly turbid, no odour	Dark grey, becoming yellow, turbid, no odour	Brown/orange, sulphidic odour	Turbid, grey	Clear, strong sulphidic odour	-	Brown	Slightly brown	Brown	Dry	Brown	Light brown, smelly	-	Tea brown	Tea brown	Light brown, some odour
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	6.9	*9.16*	8.9	-	*9.17*	8.91	8.46	7.22	7.34	7.7	6.61	8.11	8.54	-	8.61	*9.32*	-	8.6	8.65	8.72
Soluble Fluoride		1	2	1.5		mg/L	0.1	0.3	***85***	***200***	-	***170***	***210***	***210***	***24***	***25***	***9***	-	***140***	-	-	***200***	***160***	***150***		***200***	***140***
Free Cyanide	0.007			0.8		mg/L	0.004	< 0.004	-	-	-	-	-	<0.004	*<0.4*	<0.02	<0.004	-	<0.004	-	-	<0.004	<0.004	<0.005	<0.004	<0.004	0.004
Total Cyanide						mg/L	0.004	0.53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	6.7
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	*1.6*	***14.7***	***62***	-	***9***	***130***	**8**	***14***	***22***	0.89	-	**5.5**	-	-		1.6	-	-	0.54	***17***
Aluminium (dissolved)						mg/L	0.01	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table v: Results
Shallow Aquifer, Section 5

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23	Jun-23
Sample ID:							N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							8.972	9.172	8.792	8.832	9.182	-	9.342	9.322	9.312	9.182	9.332	9.502	9.282	9.802	9.72200	9.71200	9.82200	9.21200	9.292	9.052
Sample Description:							Brown, sediment, strong hydrogen sulfide odour	Clear, slightly brown, sulphidic odour	Light brown, sediments, strong sulphidic odour	Clear, sediments	Clear to slightly brown, sulphidic odour	Insufficient water for sampling	Clear, sulphidic odour	Clear, sulphidic odour	Clear to slightly turbid, yellow, sulphidic	Turbid, light brown, slight odour	Low turbid, pale brown/yellow, strong odour	Turbid, pale yellow, strong odour	Turbid, pale yellow brown, no odour	Turbid, pale yellow brown, no odour	Pale yellow brown, sulphidic odour	Turbid, pale yellow grey, no odour	Turbid, pale yellow brown, no odour	Turbid, pale grey, no odour	Slightly turbid, pale yellow, strong sulphidic odour	Cloudy, brown, no odour
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	*12.9*	8.72	8.33	8.71	8.5	-	8.64	8.53	8.7	8.69	8.21	8.67	8.68	8.27	8.26	8.86	8.41	7.81	7.9	*9*
Soluble Fluoride		1	2	1.5		mg/L	0.1	***170***	***160***	***200***	***160***	***160***	-	***140***	***130***	***57***	***110***	***110***	***110***	***95***	***82***	***79***	***25***	***5.2***	***2.9***	38	48
Free Cyanide	0.007			0.8		mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-	<0.004	<0.004	<0.004	0.008	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Total Cyanide						mg/L	0.004	7.2	7.4	6.6	9.2	8	-	5.4	3.7	2.9	5.3	2.3	1.1	0.83	0.18	0.65	0.17	0.061	0.076	1.1	1.7
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	0.95	0.28	1.5	2	0.64	-	4.9	1.6	1.3	1.6	0.52	***15***	3.7	0.71	1.6	22	9.7	2	*2.7*	*6.4*
Aluminium (dissolved)						mg/L	0.01	0.1	0.08	0.27	0.46	0.08	-	1.1	0.7	0.6	0.28	0.06	0.84	0.6	0.06	0.17	7.6	3.9	1.1	0.07	0.07

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
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Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table v: Results
Shallow Aquifer, Section 5

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Sep-23	Nov-23	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18
Sample ID:							N9	N9	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							8.852	-	7.85	7.65	7.64	-	-	7.69	8.12	8.01	7.82	-	-	7.63	-	-	-	-	-	-
Sample Description:							Turbid, dark brown, no odour	Dry	Light brown	Dry	Dry	Brown/yellow, turbid	Dry	Orange, no odour	Light brown, turbid	Light brown, slightly turbid	-	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	*8.9*	-	8.87	-	-	8.79	-	7.27	8.72	8.98	8.67	-	-	-	-	-	-	-	-
Soluble Fluoride		1	2	1.5		mg/L	0.1	92	-	***195***	-	-	-	-	***200***	***180***	-	***180***	-	-	-	-	-	-	-	-
Free Cyanide	0.007			0.8		mg/L	0.004	< 0.004	-	-	-	-	-	-	0.019	*<0.4*	-	0.058	-	-	-	-	-	-	-	-
Total Cyanide						mg/L	0.004	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	*35*	-	***60.1***	-	-	-	-	3.5	**7.7**	-	***22***	-	-	-	-	-	-	-	-
Aluminium (dissolved)						mg/L	0.01	*0.36*	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table v: Results
Shallow Aquifer, Section 5

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																						
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23
Sample ID:							W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							7.59	7.6	-	-	-	-	-	7.59	-	-	Dry	-	-	7.6	-	-	-	8.18000	-	-
Sample Description:							Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Turbid, pale yellow brown, no odour	Dry	Dry
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.56	-	-
Soluble Fluoride		1	2	1.5		mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*110*	-	-
Free Cyanide	0.007			0.8		mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 0.004	-	-
Total Cyanide						mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.8	-	-
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.1	-	-
Aluminium (dissolved)						mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.28	-	-

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
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Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table v: Results
Shallow Aquifer, Section 5

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational					
					Sample Type:		Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab
					Sample date:		Jun-23	Sep-23	Nov-23
					Sample ID:		W6S	W6S	W6S
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 5	Section 5	Section 5
					Aquifer:		Shallow	Shallow	Shallow
					SWL (m AHD):		-	-	-
					Sample Description:		Dry	Insufficient water to sample	Dry
Analyte grouping/Analyte						**Units**	**LOR**		
pH (field)	6.5-8[¤]			6.5-8.5		pH units	-	-	-	-
Soluble Fluoride		1	2	1.5		mg/L	0.1	-	-	-
Free Cyanide	0.007			0.8		mg/L	0.004	-	-	-
Total Cyanide						mg/L	0.004	-	-	-
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	-	-	-
Aluminium (dissolved)						mg/L	0.01	-	-	-

Blank Cell indicates no criterion available
[¤] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table vi: Results
Shallow Aquifer, Background

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20
Sample ID:							F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							4.95	4.86	4.93	4.73	4.67	4.76	4.46	4.3	3.82	4.41	4.19	4.16	3.8	3.71	3.75	3.39	3.75	3.85	4.23	4.04
Sample Description:							Clear to light brown	Clear	Clear	Colourless	Colourless with particles	Faint yellow	Colourless	Colourless with particles	Colourless with particles	Clear, hydrogen sulfide odour	Clear	Clear, very slight sulphidic odour	Clear, no odour	Clear, slight sulphidic odour	Clear, no odour	Clear, sulphidic odour	Clear, organic odour	Clear, slight sulphidic odour	Clear, no odour	Clear, sulphidic odour
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[¤]			6.5-8.5		pH units	-	7.38	5.58	5.25	4.46	4.11	5.08	4.21	4.57	4.3	4.46	4.35	5.02	4.96	4.71	4.6	4.54	5.38	4.75	4.71	5.01
Soluble Fluoride		1	2	1.5		mg/L	0.1	**<u><10</u>**	<0.1	<0.1	<0.1	<0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	<0.1	<0.4	<0.4	0.1	0.2
Free Cyanide	0.007			0.8		mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide						mg/L	0.004	-	-	-	-	-	-	-	-	<0.004	0.013	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	2.2	2.1	0.89	2.3	2.3	4.6	2.9	3.2	3	2.2	2.1	2	1.4	1.7	2.3	1.9	1.7	2.5	3.2	2.2
Aluminium (dissolved)						mg/L	0.01	-	-	-	-	-	-	-	-	-	1.5	1.9	1.7	1.1	0.92	1.5	1.2	1.3	2.3	2.7	1.9

Blank Cell indicates no criterion available

[¤] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table vi: Results
Shallow Aquifer, Background

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23	Jun-23	Sep-23	Nov-23	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17
Sample ID:							F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	G6	G6	G6	G6	G6	G6	G6	G6
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							5.48	4.72	4.55	4.93	5.18	5.04	5.36	5.07	4.85	4.8	4.46	4.29	2.59	2.45	2.45	3.21	2.17	2.28	2.04	1.86
Sample Description:							Clear to slightly turbid, colourless/grey, slight	Clear, colourless, slight sulphidic odour, slight	Clear with some flocculants, colourless, strong odour	Clear, colourless, black flocculants, sulphidic	Colourless, sulphidic odour	Clear, colourless, sulphidic odour	Clear and colourless with brown floccules, strong	Clear, colourless with grey floccules, no odour	Clear, colourless, no odour	Clear, colourless, no odour	Slightly turbid, pale grey brown, no odour	Clear, colourless, no odour	-	Clear	Clear	Colourless with particles	Colourless with particles	Colourless	Colourless with particles	Colourless with particles
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[¤]			6.5-8.5		pH units	-	4.63	4.69	4.68	4.48	5.45	5.37	5.07	4.74	5.84	4.5	4.9	4.3	3.6	3.82	4.04	3.79	3.66	4.55	4.21	3.86
Soluble Fluoride		1	2	1.5		mg/L	0.1	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	**<10**	<0.1	0.2	<0.1	<0.1	0.4	0.4	0.5
Free Cyanide	0.007			0.8		mg/L	0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide						mg/L	0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	2.6	2.7	2.7	2.4	1.3	3.1	2.8	2.5	*2.1*	*3.2*	*3.1*	*2.7*	***28***	0.78	0.13	***29***	***25***	***23***	***21***	***27***
Aluminium (dissolved)						mg/L	0.01	2.2	2	2.2	2	0.25	2.3	1.9	2.1	*2*	*3.1*	*2.4*	*2.5*	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available

[¤] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table vi: Results
Shallow Aquifer, Background

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Sample Type:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22
					Sample ID:	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6
					Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background
					Aquifer:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):	1.55	1.7	1.55	1.49	1.29	1.13	0.99	0.81	0.8	0.96	1.33	1.23	1.28	1.99	1.88	2.01	2.37	2.65	3.12	2.74
					Sample Description:	Colourless with particles	Clear, no odour	Clear, no odour	Clear, no odour	Clear, slight sulphidic odour	Clear, sulphidic odour	Slightly brown, strong sulphidic odour	Clear, sulphidic odour	Clear, sulphidic odour	Clear, sulphidic odour, slightly turbid	Clear, no odour	Clear, sulphidic odour	Slightly turbid, black/grey, strong odour	Clear, colourless, strong sulphidic odour, slight	Clear with flocculants, colourless, slight odour	Clear, colourless, strong sulphidic odour	Colourless, strong sulphidic odour	Clear, colourless, strong sulphidic odour	Clear and colourless with light grey floccules,	Colourless with grey flocucules
Analyte grouping/Analyte					**Units**	**LOR**																			
pH (field)	6.5-8[¤]			6.5-8.5	pH units	-	3.66	3.6	3.88	3.81	4.14	3.88	4.14	3.93	4.06	4.59	4.49	4.19	4.22	4.55	4.94	4.2	4.37	4.29	5.3	4.1
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.4	0.4	0.4	0.7	0.6	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.4	0.6	0.4	0.6	0.4	0.5	0.6	0.7
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004
Total Cyanide					mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	***27***	***25***	***23***	***25***	***16***	***17***	***9.8***	**9**	**6.9**	**7.3**	***9.3***	**6.9**	**8**	3.5	**6.6**	**7.4**	**10**	**8.7**	**12**	**17**
Aluminium (dissolved)					mg/L	0.01	-	***26***	***22***	***23***	***16***	***18***	***9.5***	**8.9**	**6.7**	**5.8**	**8.5**	**6.9**	**8**	2.8	**5.9**	**5.6**	**10**	**8.2**	**11**	**16**

Blank Cell indicates no criterion available

[¤] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in ***underline/italics*** exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table vi: Results
Shallow Aquifer, Background

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational						
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Mar-23	Jun-23	Sep-23	Nov-23
					Sample ID:		G6	G6	G6	G6
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Background	Background	Background	Background
					Aquifer:		Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		2.49	2.34	2.67	2.34
					Sample Description:		Clear, colourless, sulphidic odour	Clear, colourless, no odour	Clear, colourless, sulphidic odour	Clear, colourless, sulphidic odour
Analyte grouping/Analyte						**Units**	**LOR**				
pH (field)	6.5-8[¤]			6.5-8.5		pH units	-	4.5	5.4	4.5	4
Soluble Fluoride		1	2	1.5		mg/L	0.1	0.7	0.6	0.5	0.6
Free Cyanide	0.007			0.8		mg/L	0.004	< 0.004	< 0.004	< 0.004	< 0.004
Total Cyanide						mg/L	0.004	< 0.004	< 0.004	< 0.004	< 0.004
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	**14**	**19**	**18**	**18**
Aluminium (dissolved)						mg/L	0.01	**14**	**18**	**17**	**20**

Blank Cell indicates no criterion available

[¤] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table vii: Results
Deep Aquifer, Section 1

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18
Sample ID:							W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							12.193	12.313	11.793	11.463	11.183	10.463	11.963	11.683	11.573	11.753	11.603	11.663	11.483	11.303	11.523	11.303	10.813	10.933	11.583	11.373
Sample Description:							Brown	Brown	Brown	Dark brown, slight sulphidic odour	Brown, turbid, strong odour	Copper/brown, strong sulphidic odour	Brown	Brown	-	Brown	Brown	Brown	Brown	Dark brown	Dark brown	Tea brown	Tea brown	Reddish/tea brown	Dark brown, odour	Dark brown
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8▫			6.5-8.5	pH units	-	*10.09*	*9.9*	*10.13*	*10.1*	9.94	*9.99*	*10.11*	*10.27*	*10.34*	*10.42*	*10.29*	*10.4*	*10.02*	*10.07*	*9.37*	*10.08*	*10.1*	*10.14*	*10.18*	*13.74*
Soluble Fluoride		1	2	1.5	mg/L	0.1	***682***	***790***	***880***	***930***	***1080***	***1279***	***1300***	***1300***	***1300***	***1300***	***1400***	***1500***	***1400***	***1700***	***1300***	***1300***	***1200***	***1200***	***1200***	***1200***
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	0.03	<4	*0.058*	*0.88*	*0.21*	*0.11*	*0.11*	*0.12*	*0.15*	0.012	0.01	0.006	<0.004	0.007	0.029
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	300	330	280
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	2.86	0.6	0.67	1.4	44	0.03	0.19	0.03	3.5	0.06	0.09	0.92	***31***	1	0.08	1.6	0.28	1.1	0.71	0.39
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.77	0.52

Blank Cell indicates no criterion available

▫ Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

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Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table vii: Results
Deep Aquifer, Section 1

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23	Jun-23	Sep-23
Sample ID:							W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							11.333	11.133	11.333	11.253	10.963	11.663	8.842	12.323	12.053	11.783	12.233	11.923	12.683	11.9430	12.6930	12.7430	12.1330	12.313	11.333	11.443
Sample Description:							Brown, slight 'burnt' odour	Dark brown	Brown, very slight sulphidic odour	Brown/red, no odour	Slightly brown/red	Red/brown, sulphidic odour	Red/brown, sulphidic odour	Turbid, orange/brown, no odour	Clear to turbid, brown, slight odour	Slightly turbid, brown, strong odour	Clear to slightly turbid, dark chocolate brown, no	Clear to slightly turbid, dark brown, no odour	Clear, dark brown, sulphidic odour	Dark brown, slight sulphidic odour	Clear, dark brown, no odour	Clear, dark brown, no odour	Clear, dark brown, sulphidic odour	Clear, brown, no odour	Clear, yellow brown, no odour	Clear, brown yellow, no odour
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8▫			6.5-8.5		pH units	-	*9.87*	*9.99*	*10.1*	*10.08*	*10.14*	*10.12*	*10.11*	*10.18*	*10.09*	*9.72*	*10.11*	*10.37*	*10.19*	*10.17*	*10.65*	*10.79*	*10.99*	*10.02*	*10.6*	*10.6*
Soluble Fluoride		1	2	1.5		mg/L	0.1	***1200***	***1500***	***1200***	***1300***	***1400***	***1300***	***1100***	***800***	***1000***	***1000***	***860***	***880***	***1000***	***970***	***1100***	***840***	***1100***	***1100***	***930***	***1100***
Free Cyanide	0.007			0.8		mg/L	0.004	0.009	0.004	0.004	0.03	0.018	0.009	<0.004	0.008	0.006	0.005	0.008	0.011	0.009	0.066	0.055	0.22	0.004	0.004	0.12	0.12
Total Cyanide						mg/L	0.004	330	300	230	240	270	250	210	190	1.8	120	100	46	82	220	180	210	230	230	280	16
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	1	0.61	0.72	0.83	1.2	0.97	0.76	0.76	0.71	1.6	2	1.6	0.68	0.87	0.45	1.1	0.45	0.48	1.3	0.53
Aluminium (dissolved)						mg/L	0.01	0.69	0.51	0.7	0.73	0.7	0.76	0.78	0.69	0.58	0.73	0.6	0.6	0.56	0.73	0.73	0.6	0.55	0.43	0.74	0.48

Blank Cell indicates no criterion available

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Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table vii: Results
Deep Aquifer, Section 1

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Nov-23	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18
Sample ID:							W2D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							11.193	11.672	11.632	11.562	11.432	11.562	11.612	11.572	11.522	11.722	11.652	11.992	11.422	11.462	11.282	11.232	11.192	11.242	11.202	11.292
Sample Description:							Clear, brown, no odour	Cloudy, brown	-	Light brown/clear	Brown, no odour	Yellow/orange, no odour	Light brown/copper, no odour	-	Brown	-	Brown	Brown	Brown	Milky	Brown	Light brown	Milky brown	Light tea brown	Light yellow	Light brown, some odour
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8▫			6.5-8.5		pH units	-	*10.2*	7.22	7.29	7.53	7.44	8.32	6.8	7.23	7.23	7.18	7.1	7.27	7.39	7	7.08	7.97	7.16	7	6.97	7.29
Soluble Fluoride		1	2	1.5		mg/L	0.1	***1100***	1.21	***40***	***44***	***23***	***12***	***18***	***16***	***14***	***16***	***19***	***18***	***15***	***16***	***22***	***19***	***14***	***14***	***16***	***14***
Free Cyanide	0.007			0.8		mg/L	0.004	0.15	-	-	-	-	-	<0.004	<0.4	<0.02	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide						mg/L	0.004	220	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.6	1.6
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	0.42	1.697	1.5	***110***	2.2	3.3	3.4	2.1	2.1	4.3	3.6	2.7	1.9	4.2	***64***	2.8	5	2.2	3.4	4.1
Aluminium (dissolved)						mg/L	0.01	0.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01

Blank Cell indicates no criterion available

▫ Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

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Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table vii: Results
Deep Aquifer, Section 1

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23	Jun-23
Sample ID:							E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							11.232	11.672	11.702	11.482	11.482	11.392	10.262	11.892	12.152	12.032	11.782	11.932	11.662	11.812	12.3620	12.392	12.252	12.112	12.302	11.992
Sample Description:							Brown	Slightly brown, no odour	Clear to slightly yellow, no odour	Slightly brown, no odour	Clear to slightly brown, no odour	Clear, no odour	Bright yellow, sulphidic odour	Clear, no odour	Clear to slightly turbid, yelow, no odour	Slightly turbid, light brown, no odour	Medium turbid, yellow brown, strong odour	Clear, yellow, no odour	Clear to slightly turbid, dark yellow, slight odour	Clear, pale brown, sulphidic odour	Dark yellow brown, slight hydrocarbon odour	Clear to slightly turbid, yellow, no odour	Slightly turbid, pale yellow brown, no odour	Slightly turbid, dark yellow, sulphidic odour	Turbid, yellow, no odour	Clear, yellow, no odour
Analyte grouping/Analyte					**Units**	**LOR**																				
pH (field)	6.5-8▫			6.5-8.5	pH units	-	*12.79*	6.95	6.96	7.1	7.3	6.95	7.05	7.1	7.04	7.02	6.77	8.32	7.31	6.95	7.24	7.62	7.51	8.1	7.26	7.4
Soluble Fluoride		1	2	1.5	mg/L	0.1	**12**	**11**	**8.1**	**9.6**	**8.3**	**9.4**	**9.8**	**7.7**	**7.3**	**7.8**	**9.1**	**8.3**	**7.6**	**7.9**	**10**	**9.1**	**8.8**	**8.6**	**9.5**	**8.7**
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Total Cyanide					mg/L	0.004	1.2	0.81	1.1	0.92	0.68	1.1	2.3	0.84	0.7	0.63	0.38	0.61	0.17	0.27	0.7	1.2	0.87	0.94	1.1	1.2
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	2.2	0.72	1.3	1.2	1.2	2.5	1.2	1.3	1.6	1.3	1.6	0.33	0.42	0.27	0.27	0.84	1.3	1.2	1.9	0.51
Aluminium (dissolved)					mg/L	0.01	0.01	0.03	<0.01	0.01	<0.01	<0.01	0.01	<0.01	0.02	0.01	0.03	0.01	0.02	0.02	0.02	< 0.01	0.02	< 0.01	0.01	< 0.01

Blank Cell indicates no criterion available

▫ Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table vii: Results
Deep Aquifer, Section 1

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational				
					Sample Type:		Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab
					Sample date:		Sep-23	Nov-23
					Sample ID:		E5D	E5D
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 1	Section 1
					Aquifer:		Deep	Deep
					SWL (m AHD):		11.992	11.762
					Sample Description:		Clear, dark yellow, no odour	Turbid, yellow, no odour
Analyte grouping/Analyte					**Units**	**LOR**		
pH (field)	6.5-8▫			6.5-8.5	pH units	-	7.8	7.2
Soluble Fluoride		1	2	1.5	mg/L	0.1	**8.6**	**9.1**
Free Cyanide	0.007			0.8	mg/L	0.004	< 0.004	< 0.004
Total Cyanide					mg/L	0.004	0.065	0.9
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.4	2
Aluminium (dissolved)					mg/L	0.01	0.02	0.01

Blank Cell indicates no criterion available

▫ Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table viii: Results
Deep Aquifer, Section 2

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18
Sample ID:							W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							10.852	9.912	9.332	8.702	9.112	-	8.512	8.022	8.582	9.412	8.752	8.632	8.762	8.562	8.372	7.872	7.882	7.802	8.692	8.512
Sample Description:							Brown	-	Light brown	Light brown, turbid	-	Dry	Light brown, turbid	Light brown, slightly turbid	-	Brown	Brown	Turbid, brown	Light brown	Tea brown	Tea brown	Tea brown	Tea brown	Brown	Yellow, hydrogen sulfide odour	Slight brown/yellow
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	6.98	6.62	6.7	6.71	6.63	-	6.82	6.79	8.48	6.73	6.82	7.02	6.78	6.67	7.3	6.95	6.78	6.91	7.07	7.12
Soluble Fluoride		1	2	1.5		mg/L	0.1	***39***	***5.4***	***3.5***	***5.1***	***3.3***	-	***4.4***	***3.5***	***2.6***	***<10***	***3.1***	**3.3**	**3.4**	**3.9**	**4.4**	**4.8**	**4.2**	**4.7**	**5.1**	**4.5**
Free Cyanide	0.007			0.8		mg/L	0.004	-	-	-	-	-	-	<0.2	<0.02	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.005	<0.004	<0.004	<0.004	<0.004
Total Cyanide						mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.34	0.69	0.59
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	***21.2***	0.9	2.4	2.4	0.26	0.26	4	0.95	0.4	1.5	0.66	0.87	18	89	120	4.1	1.4	0.46	0.88	0.38
Aluminium (dissolved)						mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.14	0.14

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table viii: Results
Deep Aquifer, Section 2

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23	Jun-23	Sep-23
Sample ID:							W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							8.572	8.412	8.482	8.052	7.992	8.392	8.842	11.632	11.182	11.242	11.312	10.722	11.022	11.712	12.082	12.132	11.812	11.702	10.702	10.442
Sample Description:							Clear, slightly brown, slight sulphidic odour	Clear to slightly brown, slight sulphidic odour	Clear, slighly cloudy, sulphidic odour	Slightly brown/yellow, sulphidic odour	Slightly yellow, no odour	Bright yellow	Clear to slightly yellow	Clear, dark yellow no odour	Yellow, no odour	Clear, dark yellow, no odour	Clear, yellow/brown , no odour	Clear, dark yellow, no odour	Clear brown, no odour	Dark yellow brown, sulphidic odour	Slightly turbid, brown yellow, slight sulphidic odour	Clear, dark yellow, no odour	Turbid, pale yellow brown, slight sulphidic odour	Slightly turbid, dark yellow, no odour	Clear, dark yellow, no odour	Clear, yellow orange, no odour
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	6.76	6.92	6.83	6.91	7.16	7.12	7.17	7.57	8.14	7.34	7.78	8.13	7.71	7.77	8.51	8.57	8.92	7.82	8	8
Soluble Fluoride		1	2	1.5		mg/L	0.1	**4.8**	**3.9**	**4.7**	**4.4**	**4.8**	**4.1**	**3.8**	**8.5**	**9.2**	**11**	**11**	**9.7**	**10**	**12**	**8.8**	**9.7**	**10**	**10**	**8.8**	**8.3**
Free Cyanide	0.007			0.8		mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Total Cyanide						mg/L	0.004	0.67	0.64	0.47	0.046	0.67	0.25	0.5	1	1.1	0.6	0.19	0.23	0.1	0.81	1.4	1	1.2	1.4	1.4	220
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	0.43	0.48	0.69	0.71	0.23	0.98	2.1	1.2	0.53	0.4	0.29	0.32	0.8	1	0.3	0.38	0.72	0.34	0.42	0.21
Aluminium (dissolved)						mg/L	0.01	0.25	0.15	0.21	0.19	0.1	0.15	0.22	0.13	0.09	0.14	0.05	0.05	0.08	0.24	0.05	0.05	0.09	0.05	0.13	0.06

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table viii: Results
Deep Aquifer, Section 2

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational			
					Sample Type:		Groundwater
					Laboratory:		Envirolab
					Sample date:		Nov-23
					Sample ID:		W1D
					Project Name:		Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri
					Section:		Section 2
					Aquifer:		Deep
					SWL (m AHD):		10.562
					Sample Description:		-
Analyte grouping/Analyte					**Units**	**LOR**	
pH (field)	6.5-8[¤]			6.5-8.5	pH units	-	7.5
Soluble Fluoride		1	2	1.5	mg/L	0.1	**9.4**
Free Cyanide	0.007			0.8	mg/L	0.004	< 0.004
Total Cyanide					mg/L	0.004	0.82
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.49
Aluminium (dissolved)					mg/L	0.01	0.08

Blank Cell indicates no criterion available
[¤] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table ix: Results
Deep Aquifer, Section 3

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																						
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18
Sample ID:							W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							5.61	-	-	5.53	5.46	5.5	5.59	5.68	-	-	-	-	-	-	-	-	5.16	5.02	5.01	4.92
Sample Description:							Clear	Dry	Dry	Clear, no odour	Grey, slightly turbid, no odour	Clear, no odour	Clear	Sclear, sulphidic odour	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Turbid, suspended particles	Slightly turbid, odourless	Clear, some odour	Light brown, some odour
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	5.91	-	-	4.38	3.56	3.29	4.89	3.62	-	-	-	-	-	-	-	-	4.72	4.16	3.75	3.94
Soluble Fluoride		1	2	1.5		mg/L	0.1	1.23	-	-	0.19	0.41	0.22	0.3	0.3	-	-	-	-	-	-	-	-	0.3	0.3	0.5	0.1
Free Cyanide	0.007			0.8		mg/L	0.004	-	-	-	-	-	<0.004	<0.004	<0.004	-	-	-	-	-	-	-	-	<0.004	<0.004	<0.004	<0.004
Total Cyanide						mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.004	0.036	<0.004
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	0.7	-	-	0.58	0.72	0.76	0.81	0.04	-	-	-	-	-	-	-	-	1.4	1.2	1.5	0.9
Aluminium (dissolved)						mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3	0.91

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table ix: Results
Deep Aquifer, Section 3

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23	Jun-23	Sep-23
Sample ID:							W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							4.94	4.86	4.45	4.57	4.52	4.37	4.4	4.72	4.69	-	-	-	-	-	-	-	-	-	-	-
Sample Description:							Clear, no odour	Clear, no odour	Clear, slight sulphidic odour	-	Clear, no odour	Clear	Clear	Clear, no odour	Clear, no odour	Well damaged and unable to be sampled	Well damaged and unable to be sampled	Well damaged and unable to be sampled	Well damaged and unable to be sampled	Well damaged and unable to be sampled	Well damaged and unable to be sampled	Well damaged and unable to be sampled	Well damaged and unable to be sampled	Well damaged and unable to be sampled	Well damaged and unable to be sampled	Well damaged and unable to be sampled
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	4.53	4.81	4.21	4.15	3.96	4.14	4.54	4.53	3.93	-	-	-	-	-	-	-	-	-	-	-
Soluble Fluoride		1	2	1.5		mg/L	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.1	-	-	-	-	-	-	-	-	-	-	-
Free Cyanide	0.007			0.8		mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-	-	-	-	-	-	-	-	-	-	-
Total Cyanide						mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	1	0.81	1	1	1.1	0.99	2.3	0.97	1.2	-	-	-	-	-	-	-	-	-	-	-
Aluminium (dissolved)						mg/L	0.01	1	0.74	0.87	0.94	0.94	0.89	0.69	0.72	1.1	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table ix: Results
Deep Aquifer, Section 3

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational														
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Nov-23	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16
Sample ID:							W3D	W4D	W4D	W4D	W4D	W4D	W4D	W4D	W4D	W4D	W4D	W4D
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							-	5.539	5.459	5.439	5.459	5.369	5.939	-	-	-	-	-
Sample Description:							Well damaged and unable to be sampled	Clear	Clear	Clear	Clear to pale yellow, no odour	Clear, no odour	Clear, no odour	Clear	Clear	-	Clear	Destroyed
Analyte grouping/Analyte					**Units**	**LOR**												
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	-	6.02	5.7	5.7	5.4	5.36	4.69	-	5.18	9.9	6.08	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	-	1.48	1.7	1.3	0.41	1.6	1.1	-	0.2	-	-	-
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	-	<0.004	-	-	-	-	-
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	0.794	0.48	0.19	0.27	0.5	0.35	-	-	-	-	-
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

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Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table x: Results
Deep Aquifer, Section 4

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18
Sample ID:							W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							5.396	5.321	5.301	5.361	5.321	5.311	5.451	5.521	5.301	5.471	5.381	5.311	5.341	5.191	5.171	5.141	4.981	4.831	5.271	4.721
Sample Description:							Clear	Clear	Clear	Clear, no odour	Light brown, slightly turbid, no odour	Clear, no odour	Dry	Clear	-	Clear	Clear	Slightly turbid	Colourless	Colourless	Clear, colourless	Colourless	Faint yellow with particles	Clear with few particles	Clear some particles, no odour	Clear, slightly brown
Analyte grouping/Analyte					**Units**	**LOR**																				
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	6.02	6.32	6.1	6.11	6.11	5.34	-	6.32	8.37	6.4	5.7	6.7	6.37	6.21	6.94	6.93	6.13	6.5	6.1	*10.2*
Soluble Fluoride		1	2	1.5	mg/L	0.1	***20***	0.51	0.59	0.65	0.53	0.44	-	0.4	0.5	**<10**	0.5	0.5	0.5	0.4	0.6	0.5	0.4	0.5	0.4	0.6
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	<0.004	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.004	0.004	0.01
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.323	0.04	0.02	0.02	0.05	0.16	-	0.99	0.54	0.39	0.23	0.14	0.05	0.01	0.05	0.02	0.2	0.03	0.16	0.09
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01

Blank Cell indicates no criterion available

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Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table x: Results
Deep Aquifer, Section 4

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:						Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:						Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:						Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23	Jun-23	Sep-23
Sample ID:						W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D
Project Name:						Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:						Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:						Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4
Aquifer:						Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):						4.751	4.741	4.471	4.381	4.351	5.181	4.281	4.581	4.511	4.541	4.881	4.901	4.911	5.081	5.271	5.691	5.571	5.531	5.391	5.161
Sample Description:						Clear, no odour	-	Clear, no odour	Clear, no odour	Clear, no odour	Clear, no odour	Clear, sulphidic odour	Clear, no odour	Clear, no odour	Clear, colourless, slight odour	Slightly turbid, grey/brown, no odour	Clear to slightly turbid, colourless, no odour	Turbid, grey/brown, no odour	Colourless to very pale yellow brown, no odour	Clear to slightly turbid, colourless, no odour	Clear to slightly turbid, colourless, no odour	Clear, colourless, no odour	Clear, colourless, no odour	Clear, colourless, no odour	Slightly turbid, pale yellow brown, no odour
Analyte grouping/Analyte					**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	6.72	6.18	6.23	6.35	6.16	6.24	6.76	6.46	6.05	5.95	6.21	6.31	6	6.36	6.34	7.08	7.54	6.04	6.2	6.6
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.6	0.3	0.4	0.4	0.1	0.4	0.3	0.5	0.3	0.4	0.7	0.3	0.5	0.8	0.4	0.4	0.4	0.4	0.4	0.3
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Total Cyanide					mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	0.007	0.006	< 0.004	< 0.004	< 0.004
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.04	0.44	0.04	0.24	0.28	0.04	0.52	0.24	0.09	0.33	0.33	0.27	0.38	0.28	0.42	0.04	0.05	0.16	0.89	1
Aluminium (dissolved)					mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	0.01	<0.01	0.02	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

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Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table x: Results
Deep Aquifer, Section 4

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																						
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Nov-23	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	
Sample ID:							W5D	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							5.071	4.993	4.863	4.793	4.903	4.963	5.923	5.083	5.123	5.153	5.123	5.993	5.053	4.973	4.793	4.783	5.703	4.523	4.323	4.363	
Sample Description:							Clear, colourless, no odour	Clear	Clear	Clear	Pale yellow/brown, slightly turbid, no odour	Light grey, slightly turbid, no odour	Light brown, no odour	Brown/black	Clear, sulphidic odour	-	Turbid, black	Trubid, black	Turbid	Faint yellow	Brown	Brown	Milky	Faint yellow	-	Light brown, no odour	
Analyte grouping/Analyte						**Units**	**LOR**																				
pH (field)	6.5-8[¤]			6.5-8.5	pH units	-	6.3	3.26	6.54	4.01	3.94	3.54	3.34	6.61	5.81	8.09	6.75	6.37	5.35	4.67	4.59	5.37	3.98	4.31	3.63	4.41	
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.4	0.43	***6.2***	1.9	1.4	0.74	0.49	***8.1***	1.4	1.4	***15***	***8.6***	1.3	0.8	0.5	1	***2.1***	***2.4***	***2.1***	1.5	
Free Cyanide	0.007			0.8	mg/L	0.004	< 0.004	-	-	-	-	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	
Total Cyanide					mg/L	0.004	< 0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.054	0.013	
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.2	**5.771**	3	4.6	4.5	**6.7**	***28***	3.4	2.4	***9.1***	***24***	3.2	3.7	**5.9**	***23***	***10***	***23***	5.7	5.2	**6.9**	
Aluminium (dissolved)					mg/L	0.01	< 0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.1	

Blank Cell indicates no criterion available

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For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table x: Results
Deep Aquifer, Section 4

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23	Jun-23
Sample ID:							N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							4.223	4.243	4.163	3.933	3.813	3.733	3.623	3.753	4.023	3.973	3.983	4.423	4.423	4.473	4.673	4.923	5.243	5.193	5.053	4.923
Sample Description:							Clear, slightly brown	-	Clear, no odour	Clear to grey, no odour	Clear, no odour. Purged dry	Clear, no odour	Clear to turbid, slightly brown	Clear, sulphidic odour	Clear to slightly turbid, no odour	Clear, no odour	Very turbid, yellow/brown /grey, no odour	Very turbid, pale brown, no odour	Turbid, pale yellow brown, no odour	Turbid, pale grey, no odour	Pale yellow brown, no odour	Clear to slightly turbid, yellow, no odour	Slightly turbid, pale yellow brown, no odour	Pale yellow	Slightly turbid, pale yellow grey, no odour	Cloudy, colourless, no odour
Analyte grouping/Analyte					**Units**	**LOR**																				
pH (field)	6.5-8[¤]			6.5-8.5	pH units	-	2.8	4.18	4.34	4.51	4.05	3.85	4.09	4.54	3.88	3.55	3.94	4.22	3.98	3.68	5.35	6.97	6.68	6.03	4.85	3.7
Soluble Fluoride		1	2	1.5	mg/L	0.1	1.3	1.4	1.1	1.1	1	0.4	0.9	0.7	0.8	0.8	0.8	1.1	0.9	0.9	0.7	***3.7***	***4.3***	***3***	*2*	1.4
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Total Cyanide					mg/L	0.004	0.01	0.005	<0.004	0.005	0.007	<0.004	0.051	0.009	<0.004	<0.004	0.005	<0.004	<0.004	<0.004	< 0.004	0.15	0.14	0.027	0.029	0.017
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	4.7	5	4.2	**6.2**	**8.4**	**7.7**	**8.5**	**6.7**	4.5	3.1	***12***	***12***	**6.5**	4.4	4.1	1.9	1.5	**2.6**	*8*	*3.9*
Aluminium (dissolved)					mg/L	0.01	3.8	3.9	4.2	3.2	3.2	3.5	2.6	2.6	3.1	2.8	2.4	2.1	3.4	3	3	1.1	1.1	1.9	*1.8*	*4.6*

Blank Cell indicates no criterion available

¤ Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table x: Results
Deep Aquifer, Section 4

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational				
					Sample Type:		Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab
					Sample date:		Sep-23	Nov-23
					Sample ID:		N2	N2
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 4	Section 4
					Aquifer:		Deep	Deep
					SWL (m AHD):		4.673	4.483
					Sample Description:		Clear, colourless, no odour	Clear, colourless, no odour
Analyte grouping/Analyte					**Units**	**LOR**		
pH (field)	6.5-8[¤]			6.5-8.5	pH units	-	4.9	4
Soluble Fluoride		1	2	1.5	mg/L	0.1	1.2	1.2
Free Cyanide	0.007			0.8	mg/L	0.004	< 0.004	< 0.004
Total Cyanide					mg/L	0.004	0.03	0.013
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	*5*	*4.5*
Aluminium (dissolved)					mg/L	0.01	*3.6*	*4*

Blank Cell indicates no criterion available

¤ Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xi: Results
Deep Aquifer, Section 5

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																						
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18
Sample ID:							G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							6.632	6.502	6.552	6.552	6.492	6.482	6.622	6.682	6.712	6.712	6.552	6.552	6.502	6.352	6.342	6.342	6.142	6.042	6.032	5.992
Sample Description:							Clear	Clear	Clear	Pale brown, slightly turbid, no odour	Light brown/orange, slight odour, slightly turbid	Light brown, no odour	Clear, slightly cloudy	Turbid, brown	-	Light brown, turbid	Clear	Slightly turbid	Faint yellow	Faint yellow	Faint yellow	Faint yellow	Faint yellow	Faint yellow	Clear, no odour	Light brown, no odour
Analyte grouping/Analyte					**Units**	**LOR**																				
pH (field)	6.5-8[¤]			6.5-8.5	pH units	-	6.04	6.09	6.09	6.1	6.03	5.7	6.01	6.04	7.87	6.11	6.09	6.33	6.22	5.71	6.08	6.16	6.19	6.05	6.05	6.42
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.28	0.28	0.25	0.28	0.28	0.28	0.3	0.3	0.3	***<10***	0.3	0.3	0.3	0.4	0.2	0.3	0.4	0.3	0.3	0.4
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	<0.004	<0.004	<0.02	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.004	0.005	0.006
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.115	0.1	0.04	1.2	2.1	2.9	2	4.1	1.8	***9.6***	1.2	1.6	1.2	1.2	**6.6**	1.8	1.7	0.5	2.4	0.57
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01

Blank Cell indicates no criterion available
[¤] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xi: Results
Deep Aquifer, Section 5

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23	Jun-23	Sep-23
Sample ID:							G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							5.962	6.022	6.612	5.702	5.622	5.452	5.642	5.852	6.802	5.822	6.132	6.132	6.052	6.272	6.532	6.692	6.762	6.712	6.692	5.742
Sample Description:							Clear, no odour	Clear, no odour	Clear, no odour	Clear, no odour	Clear, no odour	Clear, no odour	Clear, no odour	Slightly turbid, pale yellow, no odour	Slightly turbid, light brown, no odour	Slightly turbid, pale grey	Clear to slightly turbid, colourless to pale grey, no	Slightly turbid, colourless, no odour	Turbid, grey, strong sulphidic odour	Dark grey, sulphidic odour	Clear and colourless with some black floccules, no	Clear, colourless, slight sulphidic odour	Clear, colourless, no odour	Slightly turbid, colourless, slight sulphidic	Clear, colourless, no odour	Clear, colourless, no odour
Analyte grouping/Analyte					**Units**	**LOR**																				
pH (field)	6.5-8[¤]			6.5-8.5	pH units	-	6.53	6.16	6.35	6.46	6.13	6.26	6.37	6.12	6.26	6	6.12	6.36	6.24	6.52	6.59	6.53	6.78	7.28	6.3	6.3
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.4	0.3	0.3	0.5	0.3	0.4	0.3	0.3	0.4	0.3	0.3
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Total Cyanide					mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	0.018	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	1.5	1	0.68	1.1	1.3	0.41	1	1.9	1.7	0.62	0.73	0.62	0.1	0.31	0.31	0.12	0.16	0.13	0.14	0.07
Aluminium (dissolved)					mg/L	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.01	<0.01	<0.01	0.03	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01

Blank Cell indicates no criterion available

[¤] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xi: Results
Deep Aquifer, Section 5

	95% Protection of Aquatic Ecosystems	**Irrigation**	**Stock Watering**	**Recreational**	**Sample Type:**	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:	Nov-23	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18
					Sample ID:	G2	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D
					Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
					Aquifer:	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
					SWL (m AHD):	6.202	5.129	5.109	5.189	5.199	5.119	5.089	5.299	5.399	5.389	5.369	5.159	5.169	5.129	4.959	4.949	4.949	4.749	4.589	4.609
					Sample Description:	Slightly cloudy, yellow brown, no odour	Clear	Clear	Clear	Pale brown, slightly turbid, no odour	Clear, no odour	Clear, no odour	Clear	Clear	-	Clear	Clear	Colourless, clear	Faint yellow	Clear	Clear, colourless	Light yellow	Clear, colourless	Colourless with particles	Turbid, light brown, no odour
Analyte grouping/Analyte					**Units**	**LOR**																				
pH (field)	6.5-8[¤]			6.5-8.5	pH units	-	6.2	6.49	6.11	5.75	5.83	5.54	8.22	5.84	5.81	5.5	5.79	5.58	6.18	5.96	5.88	6.19	5.9	5.9	5.65	5.7
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.3	1.19	0.25	0.21	0.4	0.19	0.3	0.1	0.1	-	***<10***	0.2	0.1	0.1	1.4	0.3	0.1	0.2	0.3	<0.1
Free Cyanide	0.007			0.8	mg/L	0.004	< 0.004	-	-	-	-	-	<0.004	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide					mg/L	0.004	< 0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01	0.005
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.18	1.087	0.06	0.04	1.2	0.5	0.12	0.19	0.74	-	0.08	0.08	0.17	-	1.1	0.09	***25***	2.7	0.47	***19***
Aluminium (dissolved)					mg/L	0.01	< 0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01

Blank Cell indicates no criterion available
[¤] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
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Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xi: Results
Deep Aquifer, Section 5

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																						
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23	Jun-23
Sample ID:							W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							4.509	4.559	4.569	4.289	4.269	4.169	3.959	4.089	4.379	4.339	4.319	4.679	4.699	4.659	5.019	5.229	5.389	5.369	5.329	4.889
Sample Description:							Clear, slightly brown	Clear, no odour	Slightly yellow	Clear, slight odour	Turbid, slightly brown, no odour	Clear, slight sulphidic odour	Clear, no odour	Clear, no odour	-	Turbid, yellow/brown, no odour	Very turbid, pale brown/grey, no odour	Very turbid, pale brown, no odour	Turbid, pale yellow brown, slight odour	Turbid, pale brown, no odour	Pale yellow-grey brown, no odour	Very turbid, pale yellow grey, no odour	Very turbid, pale grey brown, no odour	Very turbid, pale yellow brown grey, no odour	Very turbid, pale brown grey, no odour	Clear, brown, no odour
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	*10.47*	6.65	5.81	5.71	5.87	5.56	5.75	6.12	5.75	5.69	5.49	6.16	5.65	5.78	5.55	5.92	5.9	6.24	7.86	6
Soluble Fluoride		1	2	1.5		mg/L	0.1	0.2	0.2	<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
Free Cyanide	0.007			0.8		mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Total Cyanide						mg/L	0.004	0.006	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.028	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	0.96	2.4	3.6	0.98	3.6	1.9	1.6	4.4	3.6	3.2	**7.1**	**8.4**	**5.4**	4.1	1.5	2.4	3.1	**1.4**	*1.4*	*3*
Aluminium (dissolved)						mg/L	0.01	<0.01	0.02	0.02	0.02	0.02	0.02	0.04	0.03	0.04	0.02	0.98	0.05	0.05	0.04	< 0.01	0.05	0.02	0.03	0.03	0.03

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xi: Results
Deep Aquifer, Section 5

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational				
					Sample Type:		Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab
					Sample date:		Sep-23	Nov-23
					Sample ID:		W6D	W6D
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 5	Section 5
					Aquifer:		Deep	Deep
					SWL (m AHD):		4.929	4.909
					Sample Description:		Turbid, brown/grey, no odour	Clear, colourless, no odour
Analyte grouping/Analyte					**Units**	**LOR**		
pH (field)	6.5-8[¤]			6.5-8.5	pH units	-	6.3	5.8
Soluble Fluoride		1	2	1.5	mg/L	0.1	< 0.1	< 0.1
Free Cyanide	0.007			0.8	mg/L	0.004	< 0.004	< 0.004
Total Cyanide					mg/L	0.004	0.11	< 0.004
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	*3*	*0.45*
Aluminium (dissolved)					mg/L	0.01	0.61	< 0.01

Blank Cell indicates no criterion available

[¤] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xii: Results
Deep Aquifer, Background

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20
Sample ID:							G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							4.95	4.69	4.93	4.73	4.69	4.6	4.29	4.29	3.99	4.41	4.19	4.32	3.82	3.72	3.76	3.42	3.74	3.87	4.21	4.03
Sample Description:							Clear	-	Colourless, clear	Colourless	Colourless with suspended solids	Turbid	Light brown with particles		Colourless with few particles	Clear, some particles, no odour	Clear	Clear, very slight sulphidic odour	Clear, slight sulphidic odour	Clear, sulphidic odour	Clear, black particulates, very slight sulphidic odour	Clear, no odour	Clear, very strong sulphidic odour	Clear, sulphidic odour, black particulate	Clear, no odour	Clear, no odour
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	6.36	6.77	6.72	5.88	5.73	5.96	6.15	5.77	5.8	6.23	7.63	5.64	5.99	6	6.13	5.7	6.38	5.86	5.85	5.61
Soluble Fluoride		1	2	1.5		mg/L	0.1	<10	0.4	<0.1	0.3	0.6	0.3	0.3	0.3	0.2	0.4	1.3	0.2	<0.1	0.2	0.2	0.1	0.2	<0.1	<0.1	<0.1
Free Cyanide	0.007			0.8		mg/L	0.004	<0.004	0.006	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide						mg/L	0.004	-	-	-	-	-	-	-	-	<0.004	<0.004	0.01	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	1.8	24	0.14	0.17	6.2	3.6	4.9	0.26	0.19	0.9	0.04	0.21	0.29	0.12	0.29	0.41	0.11	0.08	0.07	0.06
Aluminium (dissolved)						mg/L	0.01	-	-	-	-	-	-	-	-	-	<0.01	<0.01	0.03	0.03	<0.01	0.01	0.02	<0.01	0.03	0.03	0.03

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xii: Results
Deep Aquifer, Background

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Mar-23	Jun-23	Sep-23	Nov-23	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17
Sample ID:							G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	F6	F6	F6	F6	F6	F6	F6	F6
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							5.46	4.71	4.44	4.91	5.15	5.02	5.38	5.06	5.08	4.64	4.39	4.26	2.84	2.68	2.75	2.62	2.46	2.53	2.28	1.9
Sample Description:							Clear, colourless, no odour	Clear, colourless, slight sulphidic odour, slight	Clear with flocculants, colourless, slight odour	Clear, colourless, sulphidic odour, black flocculants	Colourless with black floccules, sulphidic odour	Clear, colourless, no odour	Slightly turbid, colourless to very pale grey brown,	Colourless with grey floccules	Clear, colourless, no odour	Clear, colourless, no odour	Clear, colourless, no odour	Clear, colourless, no odour	-	Clear	-	Colourless	Colourless with particles	Colourless	Colourless with particles	Light grey with particles
Analyte grouping/Analyte					**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	5.26	5.5	5.59	5.39	5.49	5.92	6.19	6.1	7.08	6.2	6	6.2	6.99	6.67	7.05	6.54	6.29	7.08	6.75	6.68
Soluble Fluoride		1	2	1.5	mg/L	0.1	<0.1	0.2	<0.1	0.3	0.1	0.3	0.2	0.2	0.5	0.1	0.1	0.4	**<u>≤10</u>**	0.6	0.5	0.5	0.5	0.5	0.5	0.6
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide					mg/L	0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004	0.03	< 0.004	< 0.004	< 0.004	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.09	0.15	0.18	0.06	0.26	0.25	0.82	0.45	0.47	0.19	0.18	0.13	0.57	0.7	0.15	0.12	0.33	0.08	0.11	**7.6**
Aluminium (dissolved)					mg/L	0.01	0.03	0.03	0.03	0.03	0.03	0.04	0.48	0.08	0.3	0.02	0.14	0.09	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xii: Results
Deep Aquifer, Background

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22
Sample ID:							F6	F6	F6	F6	F6	F6	F6	F6	F6	F6	F6	F6	F6	F6	F6	F6	F6	F6	F6	F6
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							1.78	1.93	1.82	1.77	1.52	1.38	1.25	1.07	1.03	1.16	1.52	1.32	1.51	2.25	2.12	2.06	1.85	2.89	3.32	2.93
Sample Description:							Clear, colourless	Clear, no odour	Clear, no odour	Clear	Clear, slight sulphidic odour	Clear, sulphidic odour	Clear, black particulate, sulphidic odour	Clear, sulphidic odour	Clear, sulphidic odour	Clear, sulphidic odour	Clear, no odour	Clear, no odour	Clear, colourless, strong odour	Clear to slightly turbid, colourless, slight odour,	Clear to slightly turbid, colourless, no odour	Clear, colourless, sulphidic odour	Colourless, strong sulphidic odour	Clear, colourless, slight sulphidic odour	Clear and colourless with brown floccules, no odour	Clear, colourless, no odour
Analyte grouping/Analyte						**Units**	**LOR**																			
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	6.88	6.67	7.85	6.66	6.73	6.57	6.62	5.61	6.75	6.72	6.83	7.05	6.49	6.51	6.84	7.08	7.67	7.19	7.01	7.22
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.9	0.5	1	0.6	0.4	0.5	0.5	0.4	0.6	0.5	0.4	0.6	0.5	0.6	0.4	0.6	0.5	0.4	0.4	0.5
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004
Total Cyanide					mg/L	0.004	0.024	<0.004	0.032	0.005	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.008	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	0.004
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.16	0.06	0.03	0.05	0.06	0.05	0.12	0.07	0.03	0.04	0.27	0.03	0.05	0.08	0.03	<0.01	0.48	0.03	0.01	0.07
Aluminium (dissolved)					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

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
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For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
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Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xii: Results
Deep Aquifer, Background

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational						
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Mar-23	Jun-23	Sep-23	Nov-23
					Sample ID:		F6	F6	F6	F6
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Background	Background	Background	Background
					Aquifer:		Deep	Deep	Deep	Deep
					SWL (m AHD):		2.89	1.98	2.21	2.03
					Sample Description:		Clear, colourless, no odour	Clear, colourless, no odour	Clear, colourless, no odour	Clear, colourless, no odour
Analyte grouping/Analyte						**Units**	**LOR**				
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	7.19	7.3	6.9	7.1
Soluble Fluoride		1	2	1.5		mg/L	0.1	0.6	0.5	0.4	0.5
Free Cyanide	0.007			0.8		mg/L	0.004	< 0.004	< 0.004	< 0.004	< 0.004
Total Cyanide						mg/L	0.004	< 0.004	< 0.004	< 0.004	< 0.004
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	0.08	0.16	0.3	< 0.01
Aluminium (dissolved)						mg/L	0.01	< 0.01	0.07	0.07	< 0.01

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xiii: Results
QA/QC

	Duplicate Type:		Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplciate	RPD%	Primary	Intra-laboratory	RPD%	Primary	Intra-laboratory	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary
	Sample Type:		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater
	Sample date:		Feb-15	Feb-15		Feb-15	Feb-15		Feb-15	Feb-15		Jun-15	Jun-15		Jun-15	Jun-15		Jun-15	Jun-15		Sep-15	Sep-15		Sep-15
	Sample ID:		G2	QA1		G2	QA2		E11	QA3		PUMP	QA1 (QA100)		W7M	QA2 (QA101)		W7M	QA3 (QC200)		PUMP	QA100		W7M
	Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring
	Sampling Method:		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow
Analyte grouping/Analy		**Units**	**LOR**																					
Soluble Fluoride		mg/L	0.1	0.28	0.28	*0.0*	0.28	0.4	*35.3*	230	240	*4.3*	200	210	*4.9*	810	850	*4.8*	810	895	*10.0*	680	670	*1.5*	660
Free Cyanide		mg/L	0.004	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	0.005	0.005	*0.0*	<0.08	<0.08	*NC*	<2	<4	*NC*	<2	<0.040	*NC*	0.029	0.027	*7.1*	<0.04
Total Cyanide		mg/L	0.004	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	7.7	13	*51.2*	8.7	9.3	*6.7*	170	180	*5.7*	170	107	*45.5*	110	100	*9.5*	100
Aluminium (total)		mg/L	0.01	2.9	2.8	*3.5*	2.9	1.62	*56.6*	5	5.2	*3.9*	120	120	*0.0*	32	3.4	*161.6*	32	3.42	*161.4*	610	6,200	*164.2*	8700
Aluminium (dissolved)		mg/L	0.01	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-

LOR = Limit of Reporting
<value = Less than the laboratory Limit of Reporting (LOR)
Shaded cells exceed RPD >30%
NC = not calculated as one or more results are below the LOR.

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xiii: Results
QA/QC

	Duplicate Type:		Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-lboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate
	Sample Type:		Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater
	Sample date:		Sep-15		Sep-15	Sep-15		Dec-15	Dec-15		Dec-15	Dec-15		Apr-16	Apr-16		Apr-16	Apr-16		Apr-16	Apr-16		Jul-16	Jul-16
	Sample ID:		QA101		W7M	QA200		W2D	QA101		W2D	QA201		G2	QA101		G2	QA201		E11	QA102		G2	QC101
	Project Name:		Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
	Sampling Method:		Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow
Analyte grouping/Analy	**Units**	**LOR**																						
Soluble Fluoride	mg/L	0.1	13	*192.3*	660	648	*1.8*	1300	1200	*8.0*	1300	1300	*0.0*	0.2	0.2	*0.0*	0.2	0.3	*40.0*	120	120	*0.0*	0.3	0.3
Free Cyanide	mg/L	0.004	<0.004	*NC*	<0.04	<0.04	*NC*	0.88	0.67	*27.1*	0.88	0.7	*22.8*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004
Total Cyanide	mg/L	0.004	1.9	*192.5*	100	56.9	*54.9*	290	300	*3.4*	290	290	*0.0*	0.046	0.038	*19.0*	0.046	<0.004	*NC*	15	15	*0.0*	<0.004	<0.004
Aluminium (total)	mg/L	0.01	2100	*122.2*	8700	2270	*117.2*	3.5	3	*15.4*	3.5	2.8	*22.2*	9.6	8.9	*7.6*	9.6	10	*4.1*	7.6	9.4	*21.2*	1.2	1.2
Aluminium (dissolved)	mg/L	0.01	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-

LOR = Limit of Reporting
<value = Less than the laboratory Limit of Reporting (LOR
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Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xiii: Results
QA/QC

RAMBOLL

	Duplicate Type:		RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%
	Sample Type:			Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater	
	Sample date:			Jul-16	Jul-16		Jul-16	Jul-16		Oct-16	Oct-16		Oct-16	Oct-16		Oct-16	Oct-16		Dec-16	Dec-16		Dec-16	Dec-16	
	Sample ID:			G2	QC102		W7M	QC100		W5D	QA100		W5D	QA200		A7	QA101		N2	2DUP		F5	5DUP	
	Project Name:			Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	
	Sampling Method:			Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow	
Analyte grouping/Analy	**Units**	**LOR**																						
Soluble Fluoride	mg/L	0.1	*0.0*	0.3	0.2	*40.0*	870	900	*3.4*	0.5	0.4	*22.2*	0.5	0.5	*0.0*	390	390	*0.0*	0.8	0.7	13.3	<0.1	<0.1	*NC*
Free Cyanide	mg/L	0.004	*NC*	<0.004	<0.004	*NC*	0.072	0.084	*15.4*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	0.03	0.03	*0.0*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*
Total Cyanide	mg/L	0.004	*NC*	<0.004	<0.004	*NC*	250	260	*3.9*	0.005	0.005	*0.0*	0.005	<0.003	*NC*	76	94	*21.2*	0.12	0.098	20.2	<0.004	<0.004	*NC*
Aluminium (total)	mg/L	0.01	*0.0*	1.2	0.79	*41.2*	0.08	0.08	*0.0*	0.14	0.1	*7.4*	0.14	0.14	*0.0*	2.1	2.2	*4.7*	5.9	5.6	5.2	2.3	2.2	4.4
Aluminium (dissolved)	mg/L	0.01	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*

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Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xiii: Results
QA/QC

	Duplicate Type:		Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary
	Sample Type:		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater
	Sample date:		Mar-17	Mar-17		Mar-17	Mar-17		Mar-17	Mar-17		Jun-17	Jun-17		Jun-17	Jun-17		Jun-17	Jun-17		Sep-17	Sep-17		Sep-17
	Sample ID:		E5D	DUP1		E5D	TRIP1		W6D	DUP2		N8	DUP1		G2	TRIP1		G2	DUP2		G2	DUP1		G2
	Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring
	Sampling Method:		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow
Analyte grouping/Analy	**Units**	**LOR**																						
Soluble Fluoride	mg/L	0.1	22	19	14.6	22	21.9	0.5	1.4	0.5	94.7	0.4	0.4	0.0	0.2	0.3	40.0	0.2	0.3	40.0	0.3	0.3	0.0	0.3
Free Cyanide	mg/L	0.004	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004
Total Cyanide	mg/L	0.004	5.5	2.3	82.1	5.5	3.04	57.6	0.043	0.043	0.0	<0.004	0.2	*NC*	<0.004	<0.004	*NC*	<0.004	0.004	*NC*	<0.004	<0.004	*NC*	<0.004
Aluminium (total)	mg/L	0.01	64	26	84.4	64	13.1	132.0	1.1	0.8	31.6	3.9	4.9	22.7	6.6	1.04	145.5	6.6	9.4	35.0	1.8	4.9	92.5	1.8
Aluminium (dissolved)	mg/L	0.01	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-

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Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xiii: Results
QA/QC

	Duplicate Type:	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate
	Sample Type:	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater
	Sample date:	Sep-17		Sep-17	Sep-17		Dec-17	Dec-17		Dec-17	Dec-17		Dec-17	Dec-17		Mar-18	Mar-18		Mar-18	Mar-18		Mar-18	Mar-18
	Sample ID:	TRIP1		N8	DUP2		W2D	DUP1		W2D	TRIP1		G2	DUP2		F6	DUP1		G5	TRIP1		G5	DUP2
	Project Name:	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
	Sampling Method:	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow
Analyte grouping/Analy	**Units**	**LOR**																					
Soluble Fluoride	mg/L	0.1	0.4	28.6	0.4	0.4	0.0	1200	1200	0.0	1200	1430	17.5	0.4	0.4	0.0	0.9	1	10.5	0.2	0.2	0.0	0.2	0.2
Free Cyanide	mg/L	0.004	<0.004	*NC*	<0.004	<0.004	*NC*	0.006	0.012	66.7	0.006	<1	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004
Total Cyanide	mg/L	0.004	<0.004	*NC*	0.41	0.027	175.3	200	230	14.0	200	268	29.1	<0.004	<0.004	*NC*	0.024	0.023	4.3	<0.004	<0.004	*NC*	<0.004	<0.004
Aluminium (total)	mg/L	0.01	0.82	74.8	25	26.0	3.9	0.28	0.25	11.3	0.28	<100	*NC*	1.7	1.4	19.4	0.16	0.13	20.7	0.19	0.17	11.1	0.19	0.15
Aluminium (dissolved)	mg/L	0.01	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-

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Project Site: Kurri Kurri Smelter
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Table xiii: Results
QA/QC

	Duplicate Type:		RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%
	Sample Type:			Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater	
	Sample date:			Jun-18	Jun-18		Jun-18	Jun-18		Jun-18	Jun-18		Sep-18	Sep-18		Sep-18	Sep-18		Sep-18	Sep-18		Dec-18	Dec-18	
	Sample ID:			E5D	QA101		W1D	QA102		W1D	QA103		W3D	QA101		G2	QA102		G2	QA103		E5D	QA101	
	Project Name:			Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	
	Sampling Method:			Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow	
Analyte grouping/Analy	**Units**	**LOR**																						
Soluble Fluoride	mg/L	0.1	0.0	14	14	0.0	5.1	5.9	14.5	5.1	5.1	0.0	0.1	0.1	0.0	0.4	0.4	0.0	0.4	0.4	0.0	11	11	0.0
Free Cyanide	mg/L	0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.005	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*
Total Cyanide	mg/L	0.004	*NC*	1.6	1.7	6.1	0.69	0.532	25.9	0.7	0.7	4.3	<0.004	<0.004	*NC*	0.006	0.006	0.0	0.006	0.01	50.0	0.81	0.82	1.2
Aluminium (total)	mg/L	0.01	23.5	4.1	3.8	7.6	0.88	0.58	41.1	0.88	0.93	5.5	0.9	1.0	5.4	0.57	0.49	15.1	0.57	0.37	42.6	0.72	0.6	18.2
Aluminium (dissolved)	mg/L	0.01	*NC*	<0.01	<0.01	*NC*	0.14	0.1	33.3	0.1	0.1	0.0	0.9	1.0	9.4	<0.01	<0.01	*NC*	<0.01	<0.01	*NC*	0.03	0.02	40.0

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Project No: 318001662
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Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xiii: Results
QA/QC

	Duplicate Type:	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary
	Sample Type:	Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater
	Sample date:	Dec-18	Dec-18		Dec-18	Dec-18		Mar-19	Mar-19		Mar-19	Mar-19		Mar-19	Mar-19		Jun-19	Jun-19		Jun-19	Jun-19		Jun-19
	Sample ID:	W1D	QA103		W1D	QA102		W5D	QA101		G5	QA103		W5D	QA102		G2	QA101		F6	QA102		F6
	Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring
	Sampling Method:	Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow
Analyte grouping/Analy	**Units**	**LOR**																					
Soluble Fluoride	mg/L	0.1	4.8	5.7	17.1	4.8	4.8	0.0	0.3	0.3	0.0	<0.1	0.1	*NC*	0.3	0.5	50.0	0.3	0.3	0.0	0.5	0.5	0.0	0.5
Free Cyanide	mg/L	0.004	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004
Total Cyanide	mg/L	0.004	0.67	0.171	118.7	0.67	0.45	39.3	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004
Aluminium (total)	mg/L	0.01	0.43	0.76	55.5	0.43	0.51	17.0	0.44	0.38	14.6	0.3	0.3	12.9	0.44	0.36	20.0	0.7	0.7	0.0	0.05	0.04	22.2	0.05
Aluminium (dissolved)	mg/L	0.01	0.25	<0.01	*NC*	0.25	0.21	17.4	<0.01	<0.01	*NC*	30.0	30.0	0.0	<0.01	<0.01	*NC*	<0.01	<0.01	*NC*	<0.01	<0.01	*NC*	<0.01

LOR = Limit of Reporting
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Shaded cells exceed RPD >30%
NC = not calculated as one or more results are below the L

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xiii: Results
QA/QC

	Duplicate Type:		Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate
	Sample Type:		Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater
	Sample date:		Jun-19		Sep-19	Sep-19		Sep-19	Sep-19		Sep-19	Sep-19		Dec-19	Dec-19		Dec-19	Dec-19		Dec-19	Dec-19		Mar-20	Mar-20
	Sample ID:		QA103		F6	QA101		G5	QA102		G5	QA103		G2	QA101		G5	QA102		G5	QA103		F6	D01
	Project Name:		Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Groundwater M	Groundwater M		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
	Sampling Method:		Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow
Analyte grouping/Analy	**Units**	**LOR**																						
Soluble Fluoride	mg/L	0.1	0.5	0.0	0.5	0.5	0.0	0.2	0.3	40.0	0.2	0.3	40.0	0.3	<0.1	*NC*	0.1	<0.1	*NC*	0.1	0.1	0.0	0.6	0.6
Free Cyanide	mg/L	0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004
Total Cyanide	mg/L	0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004
Aluminium (total)	mg/L	0.01	0.08	46.2	0.12	0.18	40.0	0.29	0.32	9.8	0.29	0.48	49.4	1.3	1.2	8.0	0.41	0.37	10.3	0.41	0.29	34.3	0.03	0.02
Aluminium (dissolved)	mg/L	0.01	<0.01	*NC*	<0.01	<0.01	*NC*	*0.01*	<0.01	*NC*	0.01	<0.01	*NC*	<0.01	<0.01	*NC*	0.02	0.02	0.0	0.02	0.02	0	<0.01	<0.01

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Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xiii: Results
QA/QC

	Duplicate Type:		RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%
	Sample Type:			Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater	
	Sample date:			Mar-20	Mar-20		Mar-20	Mar-20		Jun-20	Jun-20		Jun-20	Jun-20		Jun-20	Jun-20		Sep-20	Sep-20		Sep-20	Sep-20	
	Sample ID:			G5	D02		G5	T01		G2	D01_170620		F6	D02_180620		F6	T01_180620		G2	DUP1		G5	DUP2	
	Project Name:			Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	
	Sampling Method:			Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow	
Analyte grouping/Analy	**Units**	**LOR**																						
Soluble Fluoride	mg/L	0.1	0.0	0.2	0.3	40.0	0.2	0.3	40.0	0.3	0.3	0.0	0.5	0.5	0.0	0.5	0.6	18.2	0.2	0.3	40.0	<0.1	0.1	*NC*
Free Cyanide	mg/L	0.004	*NC*	<0.004	<0.04	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*
Total Cyanide	mg/L	0.004	*NC*	<0.004	<0.04	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.008	*NC*
Aluminium (total)	mg/L	0.01	40.0	0.11	0.08	31.6	0.11	0.12	8.7	1	1	0.0	0.04	0.05	22.2	0.04	0.06	40.0	1.9	1.7	11.1	0.07	0.08	13.3
Aluminium (dissolved)	mg/L	0.01	*NC*	<0.01	<0.01	*NC*	<0.01	<0.01	*NC*	<0.01	<0.01	*NC*	<0.01	<0.01	*NC*	<0.01	<0.01	*NC*	<0.01	<0.01	*NC*	0.03	0.03	0.0

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Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xiii: Results
QA/QC

	Duplicate Type:		Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary
	Sample Type:		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater
	Sample date:		Sep-20	Sep-20		Dec-20	Dec-20		Dec-20	Dec-20		Dec-20	Dec-20		Mar-21	Mar-21		Mar-21	Mar-21		Mar-21	Mar-21		Jun-21
	Sample ID:		G5	TRIP1		W6D	D01_20201208		W6D	T01_20201208		F6	D02_091220		W2D	D01_20210317		F5	D02_20210325		W2D	T01_20210317		G2
	Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring
	Sampling Method:		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow
Analyte grouping/Analy		**Units**	**LOR**																					
Soluble Fluoride		mg/L	0.1	<0.1	<0.1	*NC*	<0.1	<0.1	*NC*	<0.1	0.1	*NC*	0.6	0.7	*15.4*	1000	920	8.3	0.2	0.2	0.0	1000	930	7.3	0.3
Free Cyanide		mg/L	0.004	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	0.005	0.005	0.0	<0.004	<0.004	*NC*	0.005	0.006	18.2	<0.004
Total Cyanide		mg/L	0.004	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	0.008	0.007	*13.3*	120	120	0.0	<0.004	<0.004	*NC*	120	100	18.2	<0.004
Aluminium (total)		mg/L	0.01	0.07	0.07	0.0	3.2	2.6	20.7	3.2	1.46	74.7	0.03	0.03	0.0	1.6	1.4	13.3	2.6	2.6	0.0	1.6	1.1	**37.0**	0.73
Aluminium (dissolved)		mg/L	0.01	0.03	0.02	40.0	0.02	0.02	0.0	0.02	0.01	66.7	<0.01	<0.01	*NC*	0.73	0.69	5.6	2.2	2.2	0.0	0.73	0.72	1.4	<0.01

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Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xiii: Results
QA/QC

	Duplicate Type:		Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary
	Sample Type:		Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater
	Sample date:		Jun-21		Jun-21	Jun-21		Jun-21	Jun-21		Sep-21	Sep-21		Sep-21	Sep-21		Sep-21	Sep-21		Dec-21	Dec-21		Dec-21
	Sample ID:		D01_20210615		F6	D02_20210616		G2	T01_20210615		E5D	D01_20210920		W5D	D02_20210921		E5D	T01_20210920		W5D	D01_20211202		G5
	Project Name:		Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring
	Sampling Method:		Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow
Analyte grouping/Analy		**Units**	**LOR**																				
Soluble Fluoride		mg/L	0.1		0.3	0.0	0.3	0.6	**66.7**	0.3	0.3	0.0	7.6	7.7	1.3	0.3	0.3	0.0	7.6	<0.0001	*NC*	0.5	0.5	0.0	0.3
Free Cyanide		mg/L	0.004		<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.00004	*NC*	<0.004	<0.004	*NC*	<0.004
Total Cyanide		mg/L	0.004		<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	0.17	0.2	16.2	<0.004	<0.004	*NC*	0.17	0.00126	**197.1**	<0.004	<0.004	*NC*	<0.004
Aluminium (total)		mg/L	0.01		1.9	**89.0**	2.7	0.008	**198.8**	0.73	1.3	**56.2**	0.42	0.37	12.7	0.27	0.4	**38.8**	0.42	0.26	**47.1**	0.38	0.28	**30.3**	0.06
Aluminium (dissolved)		mg/L	0.01		<0.01	*NC*	2	<0.01	*NC*	<0.01	<0.01	*NC*	0.02	0.01	**66.7**	<0.01	0.01	*NC*	0.02	0.01	**66.7**	0.02	0.02	0.0	0.03

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Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xiii: Results
QA/QC

	Duplicate Type:	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary
	Sample Type:	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater
	Sample date:	Dec-21		Dec-21	Dec-21		Mar-22	Mar-22		Mar-22	Mar-22		Mar-22	Mar-22		Jun-22	Jun-22		Jun-22	Jun-22		Jun-22
	Sample ID:	D02_20211202		W5D	101_20211201		G2	D01_20220317		G5	D02_20220318		G2	101_20220317		G5	D02_20220616		PUMP	D01_20220615		PUMP
	Project Name:	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring
	Sampling Method:	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow
Analyte grouping/Analy	**Units**	**LOR**																				
Soluble Fluoride	mg/L	0.1	0.3	0.0	0.5	0.3	**50.0**	0.3	0.3	0.0	0.1	0.1	0.0	0.3	0.3	0.0	0.3	0.4	28.6	130	140	7.4	130
Free Cyanide	mg/L	0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.002	<0.002	*NC*	<0.002	<0.002	*NC*	<0.002	<0.004	*NC*	<0.002	<0.002	*NC*	4.8	4.7	2.1	4.8
Total Cyanide	mg/L	0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.002	<0.002	*NC*	<0.002	<0.002	*NC*	<0.002	<0.004	*NC*	<0.002	<0.002	*NC*	<0.002	<0.002	*NC*	<0.002
Aluminium (total)	mg/L	0.01	0.04	**40.0**	0.38	0.1	**116.7**	310	260	17.5	260	280	7.4	310	560	**57.5**	40	40	0.0	600	620	3.3	600
Aluminium (dissolved)	mg/L	0.01	0.03	0.0	0.02	<0.01	*NC*	<5	<5	*NC*	30	30	0.0	<5	<10	*NC*	250	310	21.4	2800	3000	6.9	2800

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Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xiii: Results
QA/QC

	Duplicate Type:	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary
	Sample Type:	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater
	Sample date:	Jun-22		Sep-22	Sep-22		Sep-22	Sep-22		Sep-22	Sep-22		Sep-22	Sep-22		Dec-22	Dec-22		Dec-22	Dec-22		Dec-22
	Sample ID:	T01_20220615		W2S	D01_20220920		G5	D01_20220921		W2S	T01_20220920		G5	T01_20220921		E4	D02_20221221		W2D	D01_20221220		W2D
	Project Name:	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring
	Sampling Method:	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow
Analyte grouping/Analy	**Units**	**LOR**																				
Soluble Fluoride	mg/L	0.1	126	3.1	29	31	6.7	0.2	0.2	0.0	29	33.6	14.7	0.2	0.6	**100.0**	780	810	3.8	1100	1200	8.7	1100
Free Cyanide	mg/L	0.004	4.04	17.2	0.23	0.18	24.4	<0.002	<0.002	*NC*	0.23	0.173	28.3	<0.002	<0.004	*NC*	210	210	0.0	230	220	4.4	230
Total Cyanide	mg/L	0.004	<0.200	*NC*	<0.002	<0.002	*NC*	<0.002	<0.002	*NC*	<0.002	<0.004	*NC*	<0.002	<0.004	*NC*	0.004	0.005	22.2	0.004	0.005	22.2	0.004
Aluminium (total)	mg/L	0.01	440	**30.8**	7000	7200	2.8	480	590	20.6	7000	6620	5.6	480	290	**49.4**	380	370	2.7	550	510	7.5	550
Aluminium (dissolved)	mg/L	0.01	2630	6.3	7600	8300	8.8	820	840	2.4	7600	7350	3.3	820	670	20.1	390	370	5.3	450	450	0.0	450

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Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xiii: Results
QA/QC

RAMBOLL

	Duplicate Type:		Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate
	Sample Type:		Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater
	Sample date:		Dec-22		Mar-23	Mar-23		Mar-23	Mar-23		Mar-23	Mar-23		Jun-23	Jun-23		Jun-23	Jun-23		Jun-23	Jun-23		Sep-23	Sep-23
	Sample ID:		T01_20221220		ESD_20230323	D01_20230324		G2_20230324	D02_20230324		ESD_20230323	T01_20230323		W1D_20230622	D01_20230622		G2_20230622	D02_20230622		W1D_20230622	T01_20230622		G2	D01_20230922
	Project Name:		Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
	Sampling Method:		Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow
Analyte grouping/Analy	**Units**	**LOR**																						
Soluble Fluoride	mg/L	0.1	1050	4.7	9.5	9.3	2.1	0.4	0.4	0.0	9.5	8.6	9.9	8.8	8.6	2.3	0.3	0.3	0.0	8.8	8.5	3.5	0.3	0.3
Free Cyanide	mg/L	0.004	214	7.2	<0.004	<0.004	NC	<0.004	<0.004	NC	<0.004	<0.004	NC	<0.004	<0.004	NC	<0.004	<0.004	NC	<0.004	<0.020	NC	<0.004	<0.004
Total Cyanide	mg/L	0.004	0.621	**197.4**	1.1	1.4	24.0	<0.004	<0.004	NC	1.1	0.421	**89.3**	1.4	1.4	0.0	<0.004	<0.004	NC	1.4	0.98	**35.3**	<0.004	<0.004
Aluminium (total)	mg/L	0.01	220	**85.7**	1900	<0.01	NC	<0.01	<0.01	NC	1.9	3.2	**51.0**	0.42	0.45	6.9	0.14	0.17	19.4	0.42	0.16	**89.7**	0.07	0.1
Aluminium (dissolved)	mg/L	0.01	1740	**117.8**	10	2.3	**125.2**	0.13	0.11	16.7	0.01	<0.01	NC	0.13	0.26	66.7	<0.01	<0.01	NC	0.13	0.1	26.1	<0.01	<0.01

LOR = Limit of Reporting
<value = Less than the laboratory Limit of Reporting (LOR
Shaded cells exceed RPD >30%
NC = not calculated as one or more results are below the L

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xiii: Results
QA/QC

	Duplicate Type:		RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%
	Sample Type:			Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater	
	Sample date:			Sep-23	Sep-23		Nov-23	Nov-23		Nov-23	Nov-23	
	Sample ID:			G2	101_20230922		G2	D01_20231127		G2	101_20231127	
	Project Name:			Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	
	Sampling Method:			Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow	
Analyte grouping/Analy	**Units**	**LOR**										
Soluble Fluoride	mg/L	0.1	0.0	0.3	0.4	28.6	0.3	0.3	0.0	0.3	0.3	0.0
Free Cyanide	mg/L	0.004	NC	<0.004	<0.004	NC	<0.004	<0.004	NC	<0.004	<0.004	NC
Total Cyanide	mg/L	0.004	NC	<0.004	<0.004	NC	<0.004	<0.004	NC	<0.004	<0.004	NC
Aluminium (total)	mg/L	0.01	**35.3**	0.07	0.02	**111.1**	0.18	0.18	0.0	0.18	0.16	11.8
Aluminium (dissolved)	mg/L	0.01	NC	<10	<0.01	NC	<0.01	<0.01	NC	<0.01	<0.01	NC

LOR = Limit of Reporting
<value = Less than the laboratory Limit of Reporting (LOR
Shaded cells exceed RPD >30%
NC = not calculated as one or more results are below the L

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xiv: Results
Rinsate

	Sample Type:	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank
	Sample date:	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20
	Sample ID:	QB1	QA4 (QA300)	QA300	QA301	QA301	QA300	QA300	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	QC101	QC101	QC101	QC101	R01	QC101	QC101	R01	R01_180320
	Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Analyte grouping/Analy	**Units**	**LOR**																						
Soluble Fluoride	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
Free Cyanide	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Aluminium (total)	mg/L	0.01	*0.05*	<0.01	<0.01	*0.02*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aluminium (dissolved)	mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

LOR = Limit of Reporting

<value = Less than the laboratory Limit of Reporting (LOR)

Shaded cells indicate when above the acceptance criteria for Trip Spikes/Blanks and Rinsates

Project No: 318001662
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2023 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
14/02/2024

Table xiv: Results
Rinsate

	Sample Type:	Rinsate Blank	Rinsate Blank
	Sample date:	Sep-20	Dec-20
	Sample ID:	R01_20200923	R01_091220
	Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Analyte grouping/Analy	**Units**	**LOR**	
Soluble Fluoride	mg/L	0.1	<0.1	<0.1
Free Cyanide	mg/L	0.004	<0.004	<0.004
Total Cyanide	mg/L	0.004	<0.004	<0.004
Aluminium (total)	mg/L	0.01	<0.01	<0.01
Aluminium (dissolved)	mg/L	0.01	<0.01	<0.01

LOR = Limit of Reporting
<value = Less than the laboratory Limit of Reporting (LOR
Shaded cells indicate when above the acceptance criteria for Trip Spikes/Blanks and Rinsates

APPENDIX 4
FIELD PARAMETER FORMS

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

A7

Completed by: **Jake Bourke**

Date:	03/24/2023	Weather Conditions:	Sunny|Cloudy	Depth to Water	2.14
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	4.31
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	2.16
Sampling Type:	Low Flow	Casing Diameter:	100	Water Volume in Well	880.76
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
12:00	Dark brown	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
			SU					m bmp	
12:03	0.17	24.38	9.09	10.5	-178	0.73	203	2.16	Turbid, dark brown, no odour
12:06	0.17	24.46	9.12	10.7	-163	0.60	25.7	2.22	Turbid, dark brown, no odour
12:09	0.17	24.52	9.15	10.5	-155	0.69	27.1	2.29	Turbid, dark brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
12:13	Dark brown	No odour		Final depth to water 2.37 mbTOC

Sampling Summary

Sample Date:	03/24/2023	COC:	
Sample Time:	12:11	Analysis:	
Sample ID:	A7_20230323	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


Location name: 'A7', Date: 03/24/2023 12:13, Azimuth: 178.9453125,Latitude: -32.787499772415295, Longitude: 151.48628429523808

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

E11

Completed by: **Jake Bourke**

Date:	03/24/2023	Weather Conditions:	Sunny	Depth to Water	2.96
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	4.77
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.8
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	183.49
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:56	Pale yellow	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU					m bmp	
09:59	0.17	21.89	8.09	3.24	-54	0.66	144	2.99	Slightly turbid, pale yellow, no odour
10:02	0.17	21.94	8.13	0.002	-35	8.64	103	2.99	Slightly turbid, pale yellow, no odour
10:05	0.17	21.99	8.14	0.002	106	8.66	92.4	2.99	Slightly turbid, pale yellow, no odour
10:08	0.17	22.06	8.16	0.002	-13	8.65	68.4	2.99	Slightly turbid, pale yellow, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
10:13	Pale yellow	No odour	NO	Finals depth to water 2.96 mbTOC

Sampling Summary

Sample Date:	03/24/2023	COC:	
Sample Time:	10:11	Analysis:	
Sample ID:	E11_20230324	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


Location name: 'E11', Date: 03/24/2023 10:13, Azimuth: -1.0,Latitude: -32.786942711130585, Longitude: 151.48650163798732

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

E4

Completed by: **Jake Bourke**

Date:	03/24/2023	Weather Conditions:	Cloudy|Partly Sunny	Depth to Water	1.99
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	3.39
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.4
Sampling Type:	Low Flow	Casing Diameter:	100	Water Volume in Well	142.71
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
12:56	Dark brown	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
			SU					m bmp	
12:59	0.17	25.90	9.61	28.7	-7	1.33	5.0	2.04	Clear, dark brown, no odour
13:02	0.17	25.76	9.64	28.6	-36	0.35	5.1	2.11	Clear, dark brown, no odour
13:05	0.17	25.64	9.65	28.5	-46	0.31	5.0	2.16	Clear, dark brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
13:09	Dark brown	No odour	NA	Final depth to water 2.20 mbTOC

Sampling Summary

Sample Date:	03/24/2023	COC:	
Sample Time:	13:07	Analysis:	
Sample ID:	E4_20230324	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


RAMBOLL
E4
Location name: 'E4', Date: 03/24/2023 13:09, Azimuth: 337.1484375,Latitude: -32.788641429536774, Longitude: 151.4862314892481

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

E5

Completed by: **Jake Bourke**

Date:	03/23/2023	Weather Conditions:	Sunny|Partly Cloudy	Depth to Water	1.97
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.57
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.59
Sampling Type:	Low Flow	Casing Diameter:	100	Water Volume in Well	240.58
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
10:21	Dark yellow to brown	No odour	YES	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
10:24	0.17	24.33	9.25	19.4	212	4.97	2.3	2.03	Clear, dark yellow to brown, no odour
10:27	0.17	24.39	9.27	19.6	217	7.69	2.0	2.11	Clear, dark yellow to brown, no odour
10:30	0.17	24.45	9.28	20.3	220	7.58	1.7	2.17	Clear, dark yellow to brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
10:34	Dark yellow to brown	No odour	NO	Final depth to water 2.25 mbTOC

Sampling Summary

Sample Date:	03/23/2023	COC:	
Sample Time:	10:33	Analysis:	
Sample ID:	E5_20230323	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


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RAMBOLL
E5
Cyanides
Location name: 'E5', Date: 03/23/2023 10:34, Azimuth: 120.9375,Latitude: -32.78839089445098, Longitude: 151.48595907739502

E5D

Completed by: **Jake Bourke**

Date:	03/23/2023	Weather Conditions:	Sunny|Partly Cloudy	Depth to Water	1.88
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	5.44
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	3.56
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	362.9
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
10:43	Yellow	No odour	NA	

Field Parameters

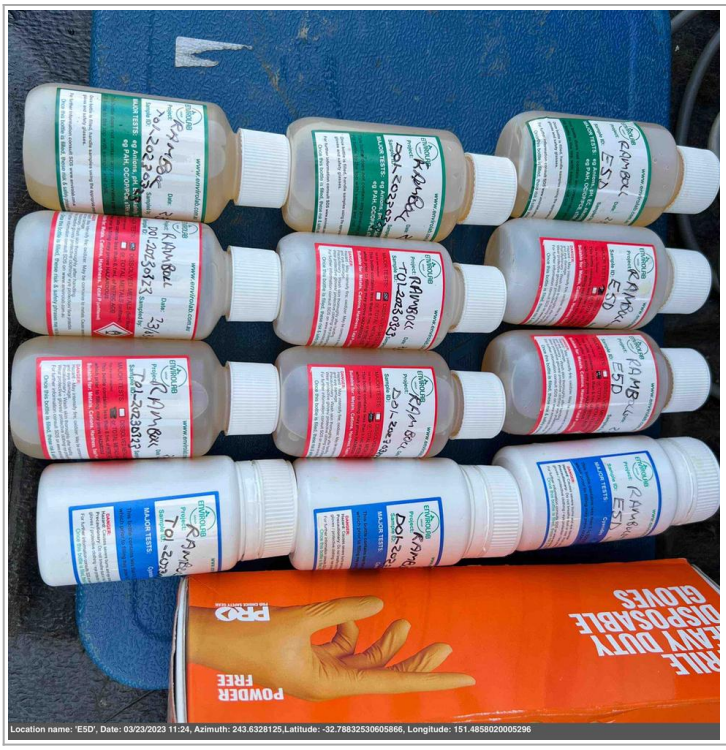
Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
10:46	0.17	24.66	7.32	14.7	-56	4.08	353	2.07	Turbid, yellow, no odour
10:49	0.17	24.73	7.23	14.5	-78	2.95	329	2.11	Turbid, yellow, no odour
10:52	0.17	24.76	7.17	14.6	-76	3.04	264	2.13	Turbid, yellow, no odour
10:55	0.17	24.73	7.26	14.4	-69	3.06	296	2.16	Turbid, yellow, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
11:27	Yellow	No odour	NO	Final depth to water 2.06 mbTOC

Sampling Summary

Sample Date:	03/23/2023	COC:	
Sample Time:	11:25	Analysis:	
Sample ID:	E5D_20230323	Bottles:	
QC Sample ID:	D01_20230333 and T01_20230323	QC Sample Time:	11:25
Remarks:			


POWDER FREE
Location name: 'E5D', Date: 03/23/2023 11:24, Azimuth: 243.6328125,Latitude: -32.78832530605866, Longitude: 151.4858020005296

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

F5

Completed by: **Jake Bourke**

Date:	03/23/2023	Weather Conditions:	Sunny|Partly Cloudy	Depth to Water	2.78
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	7.38
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	4.6
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	468.92
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
14:33	Colourless	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
14:36	0.17	28.58	6.29	6.57	66	1.26	16.2	3.03	Clear, colourless, no odour
14:39	0.17	28.64	6.29	6.44	90	0.44	6.7	3.16	Clear, colourless, no odour
14:42	0.17	28.60	6.03	6.35	110	0.21	4.8	3.24	Clear, colourless, no odour
14:45	0.16	28.50	5.81	6.29	114	0.15	4.2	3.28	Clear, colourless, no odour
14:48	0.17	28.48	5.82	6.29	113	0.12	3.5	3.32	Clear, colourless, no odour
14:51	0.17	28.40	5.84	6.27	117	0.07	3.6	3.35	Clear, colourless, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
14:57	Colourless	No odour	NO	Final depth to water 3.30 mbTOC

Sampling Summary

Sample Date:	03/23/2023	COC:	
Sample Time:	14:56	Analysis:	
Sample ID:	F5_20230322	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


Location name: 'F5', Date: 03/23/2023 14:57, Azimuth: -1.0,Latitude: -32.785948910781045, Longitude: 151.490594605125

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

F6

Completed by: **Jake Bourke**

Date:	03/23/2023	Weather Conditions:	Sunny|Partly Cloudy	Depth to Water	3.79
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	15.48
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
15:08	Colourless	No odour	NA	Clear, colourless, no odour

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
			SU					m bmp	
15:11	0.17	29.17	6.80	8.15	-28	1.39	10.3	4.16	Clear, colourless, no odour
15:14	0.17	29.12	6.90	8.33	-36	2.76	8.2	4.31	Clear, colourless, no odour
15:17	0.17	28.90	7.21	8.13	-44	0.59	5.3	4.53	Clear, colourless, no odour
15:20	0.17	28.73	7.17	8.09	-45	0.49	6.4	4.70	Clear, colourless, no odour
15:23	0.17	28.48	7.19	8.09	-44	0.46	15.9	4.97	Clear, colourless, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
15:27	Colourless	No odour		Final depth to water 5.45 mbTOC

Sampling Summary

Sample Date:	03/23/2023	COC:	
Sample Time:	15:26	Analysis:	
Sample ID:	F6_20230323	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			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RAMBOLL
F6
Sample ID:
Project:
Date:
Sampled by:
MAJOR TESTS:
Cyanides
Once this bottle is filled, these risk & safety phrase
Location name: 'F6', Date: 03/23/2023 15:29, Azimuth: 200.0390625,Latitude: -32.78757122813983, Longitude: 151.4897474617146

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

G2

Completed by: **Jake Bourke**

Date:	03/24/2023	Weather Conditions:	Sunny	Depth to Water	7.63
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	13.34
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	5.71
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	582.08
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:32	Colourless	Slight sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
			SU					m bmp	
09:35	0.17	21.92	7.21	5.57	-37	1.06	48.1	7.68	Slightly turbid, colourless, slight sulphidic odour
09:38	0.17	21.85	7.24	5.57	-11	0.38	49.9	7.74	Slightly turbid, colourless, slight sulphidic odour
09:41	0.17	21.78	7.28	5.57	-3	0.27	46.8	7.75	Slightly turbid, colourless, slight sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:49	Colourless	Slight sulphidic odour	NA	Final depth to water 7.68 mbTOC

Sampling Summary

Sample Date:	03/24/2023	COC:	
Sample Time:	09:47	Analysis:	
Sample ID:	G2_20230324	Bottles:	
QC Sample ID:	D02_20230324	QC Sample Time:	09:47
Remarks:			


Location name: 'G2', Date: 03/24/2023 09:50, Azimuth: 286.5234375,Latitude: -32.78663597538395, Longitude: 151.48667690358263

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

G5

Completed by: **Jake Bourke**

Date:	03/23/2023	Weather Conditions:	Sunny|Partly Cloudy	Depth to Water	2.51
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	11.32
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	8.81
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	898.09
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
14:08	Colourless	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU					m bmp	
14:11	0.17	29.80	7.99	0.944	52	2.93	4.6	3.03	Clear, colourless, no odour
14:14	0.17	27.66	7.65	0.754	47	1.21	4.1	3.22	Clear, colourless, no odour
14:17	0.17	28.43	7.29	0.578	68	0.92	3.3	3.49	Clear, colourless, no odour
14:20	0.17	28.48	7.16	0.536	81	0.98	4.2	3.68	Clear, pale yellow, no odour
14:23	0.17	28.36	7.14	0.514	90	1.29	4.8	3.92	Clear, pale yellow, no odour
14:26	0.17	28.26	7.08	0.507	96	1.79	5.3	4.08	Clear, pale yellow, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
14:29	Pale yellow	No odour	NO	Final depth to water 4.21 mbTOC

Sampling Summary

Sample Date:	03/23/2023	COC:	
Sample Time:	14:28	Analysis:	
Sample ID:	G5_20230323	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


Location name: 'G5', Date: 03/23/2023 14:29, Azimuth: -1.0,Latitude: -32.78579895853324, Longitude: 151.4905868937741

G6

Completed by: **Jake Bourke**

Date:	03/23/2023	Weather Conditions:	Sunny|Partly Cloudy	Depth to Water	4.06
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	6.66
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
15:38	Colourless	Sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU					m bmp	
15:41	0.17	28.56	5.80	8.22	33	0.72	24.3	4.14	ClearClear, colourless, sulphidic odour
15:44	0.17	28.50	5.39	8.10	69	0.44	19.3	4.15	Clear, colourless, sulphidic odour
15:47	0.17	28.39	5.10	7.97	103	0.20	16.8	4.16	Clear, colourless, sulphidic odour
15:50	0.17	28.13	4.72	7.88	101	0.13	8.4	4.17	Clear, colourless, sulphidic odour
15:53	0.17	27.89	4.56	7.87	97	0.04	12.9	4.17	Clear, colourless, sulphidic odour
15:56	0.17	27.62	4.50	7.89	90	0.0	15.7	4.17	Clear, colourless, sulphidic odour
15:59	0.17	27.53	4.5	7.89	86	0.0	15.5	4.17	Clear, colourless, sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
16:02	Colourless	No odour		Final depth to water 4.15 mbTOC

Sampling Summary

Sample Date:	03/23/2023	COC:	
Sample Time:	16:01	Analysis:	
Sample ID:	G6_20230323	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


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RAMBOLL
G6
Date:
Sampled by:
MAJOR TESTS:
DISSOLVED METALS
or TOTAL METALS
Cyanides
Location name: 'G6', Date: 03/23/2023 16:02, Azimuth: 334.6875,Latitude: -32.78760810851379, Longitude: 151.4897456859718

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

N2

Completed by: **Jake Bourke**

Date:	03/24/2023	Weather Conditions:	Sunny	Depth to Water	3.80
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	5.62
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.82
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	185.53
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
10:52	Pale yellow grey	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
10:55	0.17	23.29	4.77	6.53	188	0.32	172	4.11	Slightly turbid, pale yellow grey, no odour
10:58	0.17	23.27	4.63	6.50	215	0.16	164	4.24	Slightly turbid, pale yellow grey, no odour
11:01	0.17	23.25	4.49	6.40	232	0.17	165	4.39	Slightly turbid, pale yellow grey, no odour
11:04	0.17	23.23	4.53	6.18	236	0.04	98.9	4.57	Slightly turbid, pale yellow grey, no odour
11:07	0.17	23.21	4.62	5.83	232	0.05	49.1	4.78	Slightly turbid, pale yellow grey, no odour
11:10	0.17	23.18	4.77	5.11	223	0.52	35.7	4.98	Slightly turbid, pale yellow grey, no odour
11:13	0.17	23.17	4.85	4.88	221	1.09	36.4	5.08	Slightly turbid, pale yellow grey, no odour
11:16	0.17	23.17	4.85	4.84	218	1.17	32.2	5.09	Slightly turbid, pale yellow grey, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
11:21	Pale grey	No odour	NA	Final depth to water 5.10 mbTOC

Sampling Summary

Sample Date:	03/24/2023	COC:	
Sample Time:	11:20	Analysis:	
Sample ID:	N2_20230324	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


Location name: 'N2', Date: 03/24/2023 11:21, Azimuth: -1.0,Latitude: -32.78729252985938, Longitude: 151.48812965504032

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

N8

Completed by: **Jake Bourke**

Date:	03/24/2023	Weather Conditions:	Sunny	Depth to Water	3.15
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	5.21
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
08:59	Dark yellow	Slight sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
			SU					m bmp	
09:02	0.17	20.89	7.33	9.80	-96	0.69	157	3.36	Slightly turbid, dark yellow, slight sulphidic odour
09:05	0.17	21.07	6.89	9.90	-103	0.14	156	3.46	Slightly turbid, dark yellow, slight sulphidic odour
09:08	0.17	21.21	6.91	9.66	-106	0.29	149	3.64	Slightly turbid, dark yellow, slight sulphidic odour
09:11	0.17	21.33	6.97	9.34	-106	0.73	151	3.86	Slightly turbid, dark yellow, slight sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:16	Dark yellow	Slight sulphidic odour		Final depth to water 3.96 mbTOC

Sampling Summary

Sample Date:	03/24/2023	COC:	
Sample Time:	09:15	Analysis:	
Sample ID:	N8_20230324	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


Location name: 'N8', Date: 03/24/2023 09:16, Azimuth: 215.15625,Latitude: -32.78648774142636, Longitude: 151.48728643558127

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

N9

Completed by: **Jake Bourke**

Date:	03/24/2023	Weather Conditions:	Sunny	Depth to Water	2.24
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.82
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.57
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	58.1
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
08:07	Pale yellow	Strong sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
08:10	0.17	19.71	7.23	8.44	-214	2.60	87	2.52	Slightly turbid, pale yellow, strong sulphidic odour
08:13	0.17	19.74	7.41	8.46	-236	1.61	85.6	2.62	Slightly turbid, pale yellow, strong sulphidic odour
08:16	0.17	19.95	7.71	8.58	-234	1.59	86.3	2.68	Slightly turbid, pale yellow, strong sulphidic odour
08:19	0.17	19.94	7.77	8.58	-216	2.28	124	2.68	Slightly turbid, pale yellow, strong sulphidic odour
08:22	0.17	19.95	7.87	8.84	-196	3.20	116	2.68	Slightly turbid, pale yellow, strong sulphidic odour
08:25	0.17	19.95	7.92	8.97	-194	2.53	124	2.68	Slightly turbid, pale yellow, strong sulphidic odour
08:28	0.17	19.96	7.90	9.62	-191	2.29	123	2.68	Slightly turbid, pale yellow, strong sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
08:28	Pale yellow	Strong sulphidic odour	NO	Final depth to water 2.72 mbTOC

Sampling Summary

Sample Date:	03/24/2023	COC:	
Sample Time:	08:28	Analysis:	
Sample ID:	N9_20230324	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Sampled from flow cell		


Location name: 'N9', Date: 03/24/2023 08:32, Azimuth: -1.0,Latitude: -32.786404341489806, Longitude: 151.48748986437124

PUMP

Completed by: **Jake Bourke**

Date:	03/23/2023	Weather Conditions:	Sunny	Depth to Water	
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Well destroyed following reinstallation of leachate interception trench				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Well destroyed following reinstallation of leachate interception trench

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
18:01									Well destroyed following reinstallation of leachate interception trench

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Well destroyed following reinstallation of leachate interception trench

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Well destroyed following reinstallation of leachate interception trench		

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

W1D

Completed by: **Jake Bourke**

Date:	03/24/2023	Weather Conditions:	Sunny|Cloudy	Depth to Water	1.41
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	10.41
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	9.0
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	917.46
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
13:13	Dark yellow	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
			SU					m bmp	
13:16	0.17	25.51	8.25	14.8	-115	0.89	60.6	1.77	Slightly turbid, dark yellow, no odour
13:19	0.17	25.58	7.95	14.7	-168	0.17	58.1	2.0	Slightly turbid, dark yellow, no odour
13:22	0.17	25.60	7.93	14.5	-189	0.05	59.5	2.24	Slightly turbid, dark yellow, no odour
13:25	0.17	25.59	7.82	14.5	-198	0.02	57.6	2.49	Slightly turbid, dark yellow, no odour
13:28	0.17	25.58	7.83	14.6	-203	0.01	51.5	2.73	Slightly turbid, dark yellow, no odour
13:31	0.17	25.56	7.82	14.5	-207	0.0	50.8	2.99	Slightly turbid, dark yellow, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
13:34	Dark yellow	No odour	NO	Final depth to water 3.21 mbTOC

Sampling Summary

Sample Date:	03/24/2023	COC:	
Sample Time:	13:33	Analysis:	
Sample ID:	W1D_20230324	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


Location name: 'W1D', Date: 03/24/2023 13:35, Azimuth: 96.328125,Latitude: -32.78865328992976, Longitude: 151.48634523167414

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

W1S

Completed by: **Jake Bourke**

Date:	03/24/2023	Weather Conditions:	Sunny|Cloudy	Depth to Water	1.55
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.42
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.86
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	87.66
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
13:38	Dark yellow	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
			SU					m bmp	
13:41	0.17	25.78	7.46	13.9	-88	0.52	85.1	1.77	Slightly turbid, dark yellow, no odour
13:44	0.17	25.81	7.48	13.7	-124	0.20	42.0	1.91	Slightly turbid, dark yellow, no odour
13:47	0.17	25.87	7.45	13.7	-131	0.02	17.9	2.05	Slightly turbid, dark yellow, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
13:52	Dark yellow	No odour		Final depth to water 2.19 mbTOC

Sampling Summary

Sample Date:	03/24/2023	COC:	
Sample Time:	13:50	Analysis:	
Sample ID:	W1S_20230324	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


Location name: 'W1S', Date: 03/24/2023 13:52, Azimuth: 14.0625,Latitude: -32.78863447255714, Longitude: 151.48618304184777

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

W2D

Completed by: **Jake Bourke**

Date:	03/23/2023	Weather Conditions:	Cloudy	Depth to Water	1.72
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	6.38
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	4.66
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	475.04
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:15	Brown	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
09:18	0.17	21.67	10.04	35.8	-199	0.76	38.2	2.08	Clear, brown, no odour
09:21	0.17	21.72	10.04	36.0	-240	0.96	39.6	2.35	Clear, brown, no odour
09:24	0.17	21.76	10.03	36.0	-258	1.18	36.4	2.68	Clear, brown, no odour
09:27	0.17	21.80	10.03	35.9	-267	1.29	36.5	2.78	Clear, brown, no odour
09:30	0.17	21.85	10.02	35.8	-278	1.41	30.5	2.94	Clear, brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:36	Brown	No odour	NO	Final depth to water 3.18 mbTOC

Sampling Summary

Sample Date:	03/23/2023	COC:	
Sample Time:	09:36	Analysis:	
Sample ID:	W2D_20230323	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


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RAMBOLL
Date:
Sampled by:
W2D
Cyanides
Location name: 'W2D', Date: 03/23/2023 09:36, Azimuth: 227.109375,Latitude: -32.788939867199204, Longitude: 151.48581608212692

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

W2S

Completed by: **Jake Bourke**

Date:	03/23/2023	Weather Conditions:	Cloudy	Depth to Water	2.02
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.38
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.35
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	35.67
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
08:58	Orange brown	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
09:05	0.07	21.25	8.49	13.0	128	4.69	1000	2.26	Very turbid, orange brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:07	Orange brown	No odour		Well purged dry

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Insufficient water - unable to be sampled		

W3D

Completed by: **Jake Bourke**

Date:	03/23/2023	Weather Conditions:	Sunny	Depth to Water	
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Well damaged - unable to be sampled				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Well damaged - unable to be sampled

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
17:56									Well damaged - unable to be sampled

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Well damaged - unable to be sampled

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Well damaged - unable to be sampled		

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

W3S

Completed by: **Jake Bourke**

Date:	03/24/2023	Weather Conditions:	Sunny|Cloudy	Depth to Water	1.25
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.51
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.25
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	127.42
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
11:27	Dark yellow to brown	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
11:30	0.17	23.86	7.57	9.60	65	0.53	126	1.51	Slightly turbid, dark yellow to brown, no odour
11:33	0.17	23.89	7.74	9.57	136	0.51	124	1.67	Slightly turbid, dark yellow to brown, no odour
11:36	0.17	23.90	7.87	9.47	163	0.70	115	1.72	Slightly turbid, dark yellow to brown, no odour
11:39	0.17	23.92	8.02	9.33	182	1.09	96.0	1.77	Slightly turbid, dark yellow to brown, no odour
11:42	0.17	23.93	8.03	9.33	186	1.37	92.7	1.83	Slightly turbid, dark yellow to brown, no odour
11:45	0.17	23.92	7.97	9.38	190	1.39	91.7	1.89	Slightly turbid, dark yellow to brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
11:48	Dark yellow to brown	No odour		Final depth to water 1.90 mbTOC

Sampling Summary

Sample Date:	03/24/2023	COC:	
Sample Time:	11:47	Analysis:	
Sample ID:	W3S_20230324	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


Location name: 'W3S', Date: 03/24/2023 11:49, Azimuth: 124.8046875,Latitude: -32.787505430199936, Longitude: 151.4866504167686

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

W3SA

Completed by: **Jake Bourke**

Date:	03/23/2023	Weather Conditions:	Sunny	Depth to Water	
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Well damaged - unable to be sampled				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Well damaged - unable to be sampled

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
17:57									Well damaged - unable to be sampled

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Well damaged - unable to be sampled

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Well damaged - unable to be sampled		

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

W4D

Completed by: **Jake Bourke**

Date:	03/23/2023	Weather Conditions:	Sunny	Depth to Water	
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Well damaged - unable to be sampled				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Well damaged - unable to be sampled

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
			SU						
17:58									Well damaged - unable to be sampled

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Well damaged - unable to be sampled

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Well damaged - unable to be sampled		

W4S

Completed by: **Jake Bourke**

Date:	03/24/2023	Weather Conditions:	Cloudy	Depth to Water	0.70
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	1.11
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.41
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	41.79
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Insufficient water to sample				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Insufficient water to sample

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
12:15									Insufficient water to sample

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Insufficient water to sample

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Insufficient water to sample		

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

W5D

Completed by: **Jake Bourke**

Date:	03/24/2023	Weather Conditions:	Sunny	Depth to Water	5.04
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	10.62
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
10:24	Colourless	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
			SU					m bmp	
10:27	0.17	22.67	6.56	6.04	-28	0.18	28.2		Clear, colourless, no odour
10:30	0.17	22.69	6.30	6.01	-13	0.07	26.8		Clear, colourless, no odour
10:33	0.17	22.70	6.10	5.95	7	0.0	8.6		Clear, colourless, no odour
10:36	0.17	22.68	6.06	5.92	11	0.0	7.7		Clear, colourless, no odour
10:39	0.17	22.61	6.04	5.93	12	0.0	11.3		Clear, colourless, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
10:44	Colourless	No odour	NA	Final depth to water 6.66 mbTOC

Sampling Summary

Sample Date:	03/24/2023	COC:	
Sample Time:	10:42	Analysis:	
Sample ID:	W5D_20230324	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


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RAMBOLL
W5D
Location name: 'W5D', Date: 03/24/2023 10:44, Azimuth: 24.9609375,Latitude: -32.7870869636841, Longitude: 151.48722373894554

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

W5S

Completed by: **Jake Bourke**

Date:	03/24/2023	Weather Conditions:	Sunny	Depth to Water	
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	1.27
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Well dry - unable to be sampled				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Well dry - unable to be sampled

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
			SU					m bmp	
10:17									Well dry - unable to be sampled

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Well dry - unable to be sampled

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Well dry - unable to be sampled		

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

W6D

Completed by: **Jake Bourke**

Date:	03/24/2023	Weather Conditions:	Sunny	Depth to Water	4.96
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	8.81
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	3.85
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	392.47
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
08:39	Pale brown grey	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
			SU					m bmp	
08:42	0.17	20.30	7.98	0.759	-38	1.32	797	5.22	Very turbid, pale brown grey, no odour
08:45	0.17	20.34	7.93	0.761	-33	0.63	791	5.28	Very turbid, pale brown grey, no odour
08:48	0.17	20.37	7.85	0.750	-25	0.34	631	5.34	Very turbid, pale brown grey, no odour
08:51	0.17	20.36	7.86	0.739	-28	0.37	579	5.39	Very turbid, pale brown grey, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
08:54	Pale brown grey	No odour	NO	Final depth to water 5.39 mbTOC

Sampling Summary

Sample Date:	03/24/2023	COC:	
Sample Time:	08:52	Analysis:	
Sample ID:	W6D_20230324	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


Location name: 'W6D', Date: 03/24/2023 08:54, Azimuth: 251.71875,Latitude: -32.78649578805341, Longitude: 151.48763361401063

RAMBOLL

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

W6S

Completed by: **Jake Bourke**

Date:	03/24/2023	Weather Conditions:	Sunny	Depth to Water	2.99
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	3.11
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Insufficient water to sample				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Insufficient water to sample

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
			SU					m bmp	
08:35									Insufficient water to sample

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Insufficient water to sample

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Insufficient water to sample		

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

W7M

Completed by: **Jake Bourke**

Date:	03/23/2023	Weather Conditions:	Sunny|Partly Cloudy	Depth to Water	2.22
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	3.81
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.58
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	161.06
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:51	Dark yellow	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
09:54	0.17	23.29	9.30	11.5	14	1.84	16.2	2.56	Clear, dark yellow, no odour
09:57	0.17	23.32	9.29	11.5	33	1.68	14.2	2.72	Clear, dark yellow to brown, no odour
10:00	0.17	23.41	9.30	11.5	12	1.06	13.5	2.91	Clear, brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
10:09	Brown	No odour	NO	Final depth to water 2.88 mbTOC

Sampling Summary

Sample Date:	03/23/2023	COC:	
Sample Time:	10:07	Analysis:	
Sample ID:	W7M_20230323	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


Location name: 'W7M', Date: 03/23/2023 10:09, Azimuth: 21.4453125,Latitude: -32.788492986031606, Longitude: 151.48583116955263

W7S

Completed by: **Jake Bourke**

Date:	03/23/2023	Weather Conditions:	Sunny|Partly Cloudy	Depth to Water	2.0
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.31
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.31
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	31.6
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Insufficient water to sample				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Insufficient water to sample

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
09:44									Insufficient water to sample

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Insufficient water to sample

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Insufficient water to sample		

Gauging Data

Sampler: Jake Bourke

Well	Date/Time	Depth Installed	Reference Elevation (ft)	Well Depth (ft)	Depth To Water (ft)	GW Elevation (ft)	NAPL Start Depth	NAPL End Depth	Calculate NAPL Thickness	PID (ppmv)	Remarks
A7	03/24/2023 11:51		12.319	4.31	2.14	10.179					
E11	03/24/2023 09:55		10.84	4.77	2.96	7.88					
E4	03/24/2023 12:51		13.81	3.39	1.99	11.82					
E5	03/23/2023 10:15		14.104	2.57	1.97	12.134					
E5D	03/23/2023 10:39		14.182	5.44	1.88	12.302					
F5	03/23/2023 14:33		7.63	7.38	2.78	4.85					
F6	03/23/2023 15:08		6.68	15.48	3.79	2.89					
G2	03/24/2023 09:21		14.342	13.34	7.63	6.712					
G5	03/23/2023 13:58		7.59	11.32	2.51	5.08					
G6	03/23/2023 15:38		6.55	6.66	4.06	2.49					
N2	03/24/2023 10:50		8.853	5.62	3.80	5.053					
N8	03/24/2023 08:57		12.15	5.21	3.15	9					
N9	03/24/2023 08:04		11.532	2.82	2.24	9.292					
PUMP	03/23/2023 18:00		14.302			14.302					Well destroyed following reinstallatior of leachate interception trench
W1D	03/24/2023 13:13		13.112	10.41	1.41	11.702					
W1S	03/24/2023 13:37		13.177	2.42	1.55	11.627					
W2D	03/23/2023 09:12		14.033	6.38	1.72	12.313					
W2S	03/23/2023 08:57		14.229	2.38	2.02	12.209					
W3D	03/23/2023 17:55		11.29			11.29					Well damaged - unable to be sampled
W3S	03/24/2023 11:25		11.352	2.51	1.25	10.102					
W3SA	03/23/2023 17:56		10.786			10.786					Well damaged - unable to be sampled

RAMBOLL

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring
Hart Rd, Loxford

Project No.: 318001662

Well	Date/Time	Depth Installed	Reference Elevation (ft)	Well Depth (ft)	Depth To Water (ft)	GW Elevation (ft)	NAPL Start Depth	NAPL End Depth	Calculate NAPL Thickness	PID (ppmv)	Remarks
W4D	03/23/2023 17:58		10.839			10.839					Well damaged - unable to be sampled
W4S	03/24/2023 12:15		10.629	1.11	0.70	9.929					Insufficient water to sample
W5D	03/24/2023 10:17		10.571	10.62	5.04	5.531					
W5S	03/24/2023 10:16		10.493	1.27		10.493					Well dry - unable to be sampled
W6D	03/24/2023 08:37		10.289	8.81	4.96	5.329					
W6S	03/24/2023 08:35		10.69	3.11	2.99	7.7					Insufficient water to sample
W7M	03/23/2023 09:47		14.318	3.81	2.22	12.098					
W7S	03/23/2023 09:43		14.299	2.31	2.0	12.299					Insufficient water to sample

A7

1-Well Integrity

Date	06/22/2023	Time	13:00
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	Yes
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	No
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	2.41	Groundwater Elevation	
Depth Installed		Depth Measured	4.29
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)	2.41	Well Depth (m)	4.29
Water Column in Well		Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks			

2-Initial Observations

Date	06/22/2023	Time	13:04
Purge Start Time		Color	Clear brown yellow
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/22/20	13:08	0.17	500		2.48	16.03	9.9	9680	0.0	6110	122	4.7
06/22/20	13:11	0.17	0.51		2.51	15.94	9.9	9740	0.0	6140	135	4.2
06/22/20	13:15	0.17	0.68		2.56	15.91	9.9	9780	0.0	6170	138	4.3

4-Final Observations

Date	06/22/2023	Time	13:14
End purge time		Color	
Odor		Sheen/Product	NO
Remarks			

5-Sample Summary

Date	06/22/2023	Time	13:15
Did Well Dewater?	No	Sample Date	06/22/2023
Sample Time	13:15	Sample ID	A7
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth 2.56		

Photos

E11

1-Well Integrity

Date	06/22/2023	Time	15:34
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	No
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	No
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	3.22	Groundwater Elevation	
Depth Installed		Depth Measured	4.76
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)	3.22	Well Depth (m)	4.76
Water Column in Well	1.53	Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks			

2-Initial Observations

Date	06/22/2023	Time	15:35
Purge Start Time	15:36	Color	Clear colourless
Odor	No odour	Sheen/Product	
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/22/20	15:36	0.17	500		3.32	16.01	8.9	3660	1.6	2330	-105	296
06/22/20	15:39	0.17	0.51		3.26	16.02	8.9	3500	1.1	2230	-110	281
06/22/20	15:42	0.17	0.51		3.30	16.03	8.9	3380	1.3	2160	-117	274

4-Final Observations

Date	06/22/2023	Time	15:44
End purge time		Color	
Odor		Sheen/Product	NO
Remarks			

5-Sample Summary

Date	06/22/2023	Time	15:45
Did Well Dewater?	No	Sample Date	06/22/2023
Sample Time	15:45	Sample ID	E11
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth to water 3.25		

Photos

E4

1-Well Integrity

Date	06/22/2023	Time	09:26
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	No
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	2.57	Groundwater Elevation	
Depth Installed		Depth Measured	3.38
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	Partly Cloudy
Sampling Method	Low Flow - Peristaltic Pump	Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)	2.27	Well Depth (m)	3.38
Water Column in Well		Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks			

2-Initial Observations

Date	06/22/2023	Time	11:55
Purge Start Time		Color	Clear dark brown
Odor	Sulphidic odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/22/20	11:58	0.17	500		2.57	16.10	10.2	25600	11.9	16000	-415	127
06/22/20	12:01	0.17	0.51		2.45	16.17	10.2	26800	18.4	16600	-439	128
06/22/20	12:04	0.17	0.51		2.50	16.23	10.2	26700	18.4	16500	-444	127

4-Final Observations

Date	06/22/2023	Time	12:05
End purge time	12:07	Color	
Odor		Sheen/Product	NO
Remarks			

5-Sample Summary

Date	06/22/2023	Time	12:09
Did Well Dewater?	No	Sample Date	06/22/2023
Sample Time	12:10	Sample ID	E4
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth 2.57		

Photos

E5

1-Well Integrity

Date	06/23/2023	Time	13:19
Type of well head		Is well accessible? (add comment/picture)	
Well Secured on initial inspection		Is Well ID Visible?	
Water in the well box		Protective casing or sleeve around well in good condition (if no comment)	
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	2.25	Groundwater Elevation	
Depth Installed		Depth Measured	2.56
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)		Well Depth (m)	
Water Column in Well		Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks	Insufficient water for sampling		

Photos

E5D

1-Well Integrity

Date	06/23/2023	Time	13:02
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	Yes
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	No
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	2.19	Groundwater Elevation	
Depth Installed		Depth Measured	5.41
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)	2.19	Well Depth (m)	5.41
Water Column in Well		Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks			

2-Initial Observations

Date	06/23/2023	Time	13:03
Purge Start Time		Color	Clear yellow
Odor	No odour	Sheen/Product	
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/23/20	13:07	0.17	500		2.34	17.95	7.2	8560	1.6	5390	88	71.2
06/23/20	13:10	0.17	0.51		2.40	18.10	7.3	8540	1.8	5380	90	56.0
06/23/20	13:13	0.17	0.51		2.45	18.19	7.4	8520	1.8	5370	88	60.8

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/23/20	13:16	0.17	0.51		2.49	18.31	7.4	8510	1.5	5360	72	66.6

5-Sample Summary

Date	06/23/2023	Time	13:15
Did Well Dewater?	No	Sample Date	06/23/2023
Sample Time	13:15	Sample ID	E5D
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth		

Photos

F5

1-Well Integrity

Date	06/23/2023	Time	12:05
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	Yes
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	No
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	2.83	Groundwater Elevation	
Depth Installed		Depth Measured	7.39
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)	2.93	Well Depth (m)	7.39
Water Column in Well		Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks			

2-Initial Observations

Date	06/23/2023	Time	12:06
Purge Start Time	12:07	Color	Clear colourless
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/23/20	12:10	0.17	500		3.18	17.09	4.6	6530	1.2	4120	103	57.5
06/23/20	12:13	0.17	0.51		3.24	17.10	4.6	6600	0.5	4160	103	54.6
06/23/20	12:16	0.17	0.51		3.29	17.11	4.5	6620	0.2	4170	101	48.3

4-Final Observations

Date	06/23/2023	Time	12:17
End purge time	12:17	Color	
Odor		Sheen/Product	NO
Remarks			

5-Sample Summary

Date	06/23/2023	Time	12:17
Did Well Dewater?	No	Sample Date	06/23/2023
Sample Time	12:17	Sample ID	F5
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth 3.31		

Photos

F6

1-Well Integrity

Date	06/23/2023	Time	10:58
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	No
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	No
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	4.7	Groundwater Elevation	
Depth Installed		Depth Measured	15.45
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)	4.7	Well Depth (m)	15.45
Water Column in Well	10.75	Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks			

2-Initial Observations

Date	06/23/2023	Time	11:03
Purge Start Time	11:10	Color	Clear colourless
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/23/20	11:12	0.17	500		4.98	16.44	7.2	5660	1.6	3560	-72	56.5
06/23/20	11:15	0.17	0.51		5.27	16.70	7.3	5590	1.6	3520	-81	44.8
06/23/20	11:18	0.17	0.51		5.43	16.78	7.3	5600	1.9	3530	-82	54.1

4-Final Observations

Date	06/23/2023	Time	11:21
End purge time	11:24	Color	
Odor		Sheen/Product	
Remarks			

5-Sample Summary

Date	06/23/2023	Time	11:24
Did Well Dewater?	No	Sample Date	06/23/2023
Sample Time	11:24	Sample ID	F6
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth 5.61		

Photos

G2

1-Well Integrity

Date	06/22/2023	Time	14:02
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	No
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	No
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	7.65	Groundwater Elevation	
Depth Installed		Depth Measured	13.36
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)	7.65	Well Depth (m)	13.36
Water Column in Well	5.7	Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks			

2-Initial Observations

Date	06/22/2023	Time	14:04
Purge Start Time	14:09	Color	Clear colourless
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/22/20	14:13	0.17	500		7.90	16.71	6.3	3530	0.3	2260	2	30.8
06/22/20	14:16	0.17	0.51		7.92	16.78	6.3	3530	0.2	2260	4	31.4
06/22/20	14:19	0.17	0.51		7.98	16.82	6.3	3530	0.1	2260	4	26.5

4-Final Observations

Date	06/22/2023	Time	14:18
End purge time		Color	
Odor		Sheen/Product	NO
Remarks			

5-Sample Summary

Date	06/22/2023	Time	14:24
Did Well Dewater?	No	Sample Date	06/22/2023
Sample Time	14:24	Sample ID	G2
QC Sample ID	D01_20230622	Analysis	
Sample Preservation		Bottles	
Remarks	Final depth 7.82		

Photos

G5

1-Well Integrity

Date	06/23/2023	Time	11:38
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	No
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	No
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	2.95	Groundwater Elevation	
Depth Installed		Depth Measured	11.32
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)	2.95	Well Depth (m)	11.32
Water Column in Well	8.37	Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks			

2-Initial Observations

Date	06/23/2023	Time	11:39
Purge Start Time		Color	Clear colourless
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/23/20	11:47	0.17	500		2.95	17.24	6.5	2520	0.4	1620	-18	8.9
06/23/20	11:50	0.17	0.51		3.21	17.26	6.3	2510	0.3	1610	-2	8.0
06/23/20	11:53	0.17	0.51		3.5	17.28	6.2	2500	0.2	1600	12	7.2

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/23/20	11:56	0.17	0.51		3.66	17.36	6.2	2450	0.0	1570	49	6.3

4-Final Observations

Date	06/23/2023	Time	11:52
End purge time		Color	
Odor		Sheen/Product	NO
Remarks			

5-Sample Summary

Date	06/23/2023	Time	11:58
Did Well Dewater?	No	Sample Date	06/23/2023
Sample Time	11:58	Sample ID	G5
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth to water 3.96		

Photos

G6

1-Well Integrity

Date	06/23/2023	Time	10:26
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	No
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	No
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	4.21	Groundwater Elevation	
Depth Installed		Depth Measured	6.68
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)	4.21	Well Depth (m)	6.68
Water Column in Well	2.46	Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks			

2-Initial Observations

Date	06/23/2023	Time	10:28
Purge Start Time	10:28	Color	Clear colourless
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/23/20	10:40	0.17	500		4.25	14.95	5.5	5470	0.3	3450	88	0.8
06/23/20	10:43	0.17	0.51		4.28	15.01	5.5	5450	0.3	3440	85	0.8
06/23/20	10:46	0.17	0.51		4.27	15.09	5.4	5450	0.3	3440	80	0.7

5-Sample Summary

Date	06/23/2023	Time	10:55
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	G6
QC Sample ID	D01_20230623	Analysis	
Sample Preservation		Bottles	
Remarks	Final depth 4.23		

Photos

N2

1-Well Integrity

Date	06/23/2023	Time	12:27
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	Yes
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	No
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	3.93	Groundwater Elevation	
Depth Installed		Depth Measured	5.63
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)	3.93	Well Depth (m)	5.63
Water Column in Well		Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks			

2-Initial Observations

Date	06/23/2023	Time	12:27
Purge Start Time	12:39	Color	Cloudy colourless
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/23/20	12:28	0.17	500		4.46	16.95	3.7	4370	4.7	2800	438	145
06/23/20	12:31	0.17	0.51		4.60	16.94	3.7	4380	4.6	2800	451	80.8
06/23/20	12:35	0.17	0.68			16.95	3.7	4380	4.5	2810	458	50.2

5-Sample Summary

Date	06/23/2023	Time	12:28
Did Well Dewater?		Sample Date	06/23/2023
Sample Time	12:56	Sample ID	N2
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth 4.82		

Photos

N8

1-Well Integrity

Date	06/22/2023	Time	15:09
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	No	Is Well ID Visible?	Yes
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	Yes
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	3.43	Groundwater Elevation	
Depth Installed		Depth Measured	5.21
Well Dry?	N	Free Product?	No
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)		Well Depth (m)	
Water Column in Well		Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks			

2-Initial Observations

Date	06/22/2023	Time	15:10
Purge Start Time	15:11	Color	Turbid, yellow brown
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/22/20	15:14	0.17	0.51		3.77	16.24	6.33	6130	0.62	3850	-91	112
06/22/20	15:17	0.17	0.51		3.86	16.41	6.83	6130	0.24	3860	-100	167
06/22/20	15:20	0.17	0.51		4.01	16.42	6.88	6140	0.21	3870	-102	426

Date	Time	Flow Rate (ml/ min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/22/20	15:23	0.17	0.51		4.19	16.44	6.89	6130	0.17	3860	-104	674

4-Final Observations

Date	06/22/2023	Time	15:11
End purge time		Color	Turbid, yellow brown
Odor	No odour	Sheen/Product	NO
Remarks	Final depth to water 4.29 mbTOC		

5-Sample Summary

Date	06/22/2023	Time	15:23
Did Well Dewater?	No	Sample Date	06/22/2023
Sample Time	15:23	Sample ID	N8_20230622
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks			

Photos

N9

1-Well Integrity

Date	06/22/2023	Time	14:30
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	No
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	2.48	Groundwater Elevation	
Depth Installed		Depth Measured	2.82
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)	2.48	Well Depth (m)	2.82
Water Column in Well		Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks			

2-Initial Observations

Date	06/22/2023	Time	14:31
Purge Start Time	14:37	Color	Cloudy brown
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/22/20	14:38	0.17	500		2.78	16.18	9.0	5620	4.5	3540	-95	236
06/22/20	14:40	0.17	0.34			16.13	9.0	5730	4.8	3620	-94	254

4-Final Observations

Date	06/22/2023	Time	14:41
End purge time		Color	Cloudy brown
Odor	No odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	06/22/2023	Time	14:42
Did Well Dewater?	Yes	Sample Date	06/22/2023
Sample Time	14:42	Sample ID	N9
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth to water 2.82 - sampled from flow cell		

Photos

W1D

1-Well Integrity

Date	06/22/2023	Time	12:11
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	Yes
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	No
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	2.41	Groundwater Elevation	
Depth Installed		Depth Measured	10.41
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	Cloudy
Sampling Method	Low Flow - Peristaltic Pump	Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)	2.41	Well Depth (m)	10.41
Water Column in Well	8.0	Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks			

2-Initial Observations

Date	06/22/2023	Time	12:13
Purge Start Time		Color	Clear dark yellow
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/22/20	12:18	0.17	500		2.41	15.12	8.3	9350	2.9	5890	-246	10.9
06/22/20	12:21	0.17	0.51		2.52	15.36	8.2	9340	2.8	5880	-249	7.7
06/22/20	12:24	0.17	0.51		2.55	15.41	8.1	9340	2.6	5880	-253	7.4

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/22/20	12:27	0.17	0.51		3.0	15.66	8.0	9250	2.2	5820	-258	21.5
06/22/20	12:27	0.17	0.0		3.97	15.76	8.0	9200	2.1	5780	-258	21.2

4-Final Observations

Date	06/22/2023	Time	12:15
End purge time	12:34	Color	Clear dark yellow
Odor	No odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	06/22/2023	Time	12:15
Did Well Dewater?	No	Sample Date	06/22/2023
Sample Time	12:15	Sample ID	W1D
QC Sample ID	D01_20230622, T01_20230621	Analysis	
Sample Preservation		Bottles	
Remarks	Final depth to water		

Photos

W1S

1-Well Integrity

Date	06/22/2023	Time	12:37
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	Yes
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	No
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	1.88	Groundwater Elevation	
Depth Installed		Depth Measured	2.42
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)	2.4	Well Depth (m)	2.42
Water Column in Well		Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks			

2-Initial Observations

Date	06/22/2023	Time	12:41
Purge Start Time		Color	Cloudy yellow
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
06/22/20	12:41	0.17	500		1.99	15.44	8.3	8190	2.0	5170	-150	1000	
06/22/20	12:42	0.17	0.17		2.13	15.49	8.0	8230	1.6	5190	-151	1000	
06/22/20	12:43	0.17	0.17		2.39	15.51	8.0	8250	1.5	5200	-150	1000	

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
06/22/20	12:44	0.17	0.17		2.42	15.54	8.0	8270	1.3	5210	-149	1000	

4-Final Observations

Date	06/22/2023	Time	12:50
End purge time		Color	
Odor		Sheen/Product	NO
Remarks			

5-Sample Summary

Date	06/22/2023	Time	12:53
Did Well Dewater?	Yes	Sample Date	
Sample Time		Sample ID	W1S
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth 2.42		

Photos

W2D

1-Well Integrity

Date	06/23/2023	Time	13:24
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	Yes
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	No
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	2.7	Groundwater Elevation	
Depth Installed		Depth Measured	6.34
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)	2.7	Well Depth (m)	6.34
Water Column in Well		Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks			

2-Initial Observations

Date	06/23/2023	Time	13:26
Purge Start Time	13:28	Color	Clear yellow brown
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/23/20	13:30	0.17	500		2.47	19.00	10.6	33300	0.8	20300	-336	6.1
06/23/20	13:33	0.17	0.51		2.73	19.07	10.6	33300	1.1	20300	-349	6.1
06/23/20	13:36	0.17	0.51		2.88	19.10	10.6	33300	1.3	20300	-354	5.9

4-Final Observations

Date	06/23/2023	Time	13:45
End purge time		Color	
Odor		Sheen/Product	NO
Remarks			

5-Sample Summary

Date	06/23/2023	Time	13:45
Did Well Dewater?	No	Sample Date	06/23/2023
Sample Time	13:45	Sample ID	W2D
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth 3.20		

Photos

W2S

1-Well Integrity

Date	06/23/2023	Time	13:23
Type of well head		Is well accessible? (add comment/picture)	
Well Secured on initial inspection		Is Well ID Visible?	
Water in the well box		Protective casing or sleeve around well in good condition (if no comment)	
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	2.34	Groundwater Elevation	
Depth Installed		Depth Measured	2.34
Well Dry?	Y	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)		Well Depth (m)	
Water Column in Well		Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks	Well dry		

Photos

W3S

1-Well Integrity

Date	06/22/2023	Time	13:18
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	Yes
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	No
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	1.81	Groundwater Elevation	
Depth Installed		Depth Measured	2.43
Well Dry?		Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)	1.81	Well Depth (m)	2.43
Water Column in Well		Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks			

2-Initial Observations

Date	06/22/2023	Time	13:21
Purge Start Time		Color	Clear dark brown
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/22/20	13:23	0.17	500		2.1	16.22	8.3	5870	2.6	3700	293	37.4
06/22/20	13:28	0.17	0.85		2.17	15.56	8.2	5720	2.1	3600	286	34.1
06/22/20	13:30	0.17	0.34		2.24	15.68	8.2	5710	2.0	3590	285	34.7

4-Final Observations

Date	06/22/2023	Time	13:32
End purge time		Color	
Odor		Sheen/Product	NO
Remarks			

5-Sample Summary

Date	06/22/2023	Time	13:32
Did Well Dewater?	No	Sample Date	06/22/2023
Sample Time	13:32	Sample ID	WS3
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth to water 2.30		

Photos

W4S

1-Well Integrity

Date	06/22/2023	Time	12:56
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	Yes
Water in the well box		Protective casing or sleeve around well in good condition (if no comment)	
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW		Groundwater Elevation	
Depth Installed		Depth Measured	1.11
Well Dry?	Y	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)		Well Depth (m)	
Water Column in Well		Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks	Well dry		

Photos

W5D

1-Well Integrity

Date	06/22/2023	Time	13:41
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	Yes
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	No
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	5.18	Groundwater Elevation	
Depth Installed		Depth Measured	10.62
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)	5.18	Well Depth (m)	10.62
Water Column in Well	5.43	Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks			

2-Initial Observations

Date	06/22/2023	Time	13:44
Purge Start Time	13:44	Color	Clear colourless
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/22/20	13:48	0.17	500		6.4	17.30	6.3	3800	0.1	2430	-8	96.3
06/22/20	13:51	0.17	0.51		6.4	17.30	6.3	3800	0.1	2430	-8	135
06/22/20	13:54	0.17	0.51		6.4	17.33	6.2	3800	0.0	2430	-7	156

4-Final Observations

Date	06/22/2023	Time	13:54
End purge time		Color	
Odor		Sheen/Product	NO
Remarks			

5-Sample Summary

Date	06/22/2023	Time	13:54
Did Well Dewater?	No	Sample Date	06/22/2023
Sample Time	13:54	Sample ID	W5D
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth to water 6.5		

Photos

W5S

1-Well Integrity

Date	06/22/2023	Time	13:40
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	Yes
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	No
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW		Groundwater Elevation	
Depth Installed		Depth Measured	
Well Dry?		Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)		Well Depth (m)	
Water Column in Well		Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks	Well dry		

Photos

W6D

1-Well Integrity

Date	06/22/2023	Time	14:50
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	Yes
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	5.4	Groundwater Elevation	
Depth Installed		Depth Measured	8.81
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)	5.4	Well Depth (m)	8.81
Water Column in Well		Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks			

2-Initial Observations

Date	06/22/2023	Time	14:53
Purge Start Time		Color	Clear brown
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/22/20	14:53	0.17	500		5.41	16.61	6.5	678	0.1	434	58	547
06/22/20	14:53	0.17	0.0		5.45	16.68	6.2	671	0.0	430	69	521
06/22/20	14:56	0.17	0.51		5.55	16.75	6.0	670	0.0	428	76	486

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/22/20	14:59	0.17	0.51		5.64	16.75	6.0	662	0.0	423	82	482
06/22/20	15:01	0.17	0.34		5.65	16.78	6.0	659	0.0	422	85	453

4-Final Observations

Date	06/22/2023	Time	14:53
End purge time		Color	
Odor		Sheen/Product	NO
Remarks			

5-Sample Summary

Date	06/22/2023	Time	14:53
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	W6D
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth 5.70		

Photos

W6S

1-Well Integrity

Date	06/22/2023	Time	14:48
Type of well head		Is well accessible? (add comment/picture)	
Well Secured on initial inspection	NA	Is Well ID Visible?	
Water in the well box		Protective casing or sleeve around well in good condition (if no comment)	
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW		Groundwater Elevation	
Depth Installed		Depth Measured	
Well Dry?	Y	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)		Well Depth (m)	
Water Column in Well		Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks	Well dry		

Photos

W7M

1-Well Integrity

Date	06/23/2023	Time	09:36
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	Yes
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	No
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	2.46	Groundwater Elevation	
Depth Installed		Depth Measured	3.80
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)	2.46	Well Depth (m)	3.80
Water Column in Well		Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks			

2-Initial Observations

Date	06/23/2023	Time	09:38
Purge Start Time	09:48	Color	Clear brown
Odor	Sulphidic odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/23/20	09:50	0.17	500		2.96	14.75	10.4	2200	0.3	13400	-238	249
06/23/20	09:52	0.17	0.34		3.5	14.56	10.4	20100	0.3	12400	-243	171
06/23/20	09:56	0.17	0.68		3.38	14.46	10.4	19300	0.3	12000	-255	96.3

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Temperat (C)	pH	Spec Cond (uS/cm)	Dissolvec Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)
06/23/20	09:59	0.17	0.51		3.40	14.29	10.4	19300	0.3	12000	-258	65.3

5-Sample Summary

Date	06/23/2023	Time	10:08
Did Well Dewater?	No	Sample Date	06/23/2023
Sample Time	10:08	Sample ID	W7M
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Finals depth 3.46		

Photos

W7S

1-Well Integrity

Date	06/23/2023	Time	10:09
Type of well head		Is well accessible? (add comment/picture)	Yes
Well Secured on initial inspection	Yes	Is Well ID Visible?	Yes
Water in the well box	No	Protective casing or sleeve around well in good condition (if no comment)	No
Any cleanup performed (explain)		Any repairs/replacement (explain)	
PID		Reference Elevation	
DTW	2.38	Groundwater Elevation	
Depth Installed		Depth Measured	2.38
Well Dry?	Y	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Weather Conditions	
Sampling Method		Volume Units	
Water Quality Meter		Sampling Type	
Casing Material		Casing Diameter (mm)	
Screen Interval		Pump Intake Depth	
Depth to Water (m)		Well Depth (m)	
Water Column in Well		Volume in Well	
Correction		Total Volume to Remove	
Coordinates			
Remarks	Well dry		

Photos

A7

1-Well Integrity

Date	09/22/2023	Time	11:37
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	No
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	4.25	Groundwater Elevation	
Depth Installed		Depth Measured	4.29
Well Dry?	Y	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	
Well Depth (m)		Water Column in Well	
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks	Insufficient water for sampling		

2-Initial Observations

Date	09/22/2023	Time	11:38
Purge Start Time		Color	
Odor		Sheen/Product	
Remarks	Insufficient water for sampling		

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/22/23	11:38												Insufficie water for samplin

4-Final Observations

Date	09/22/2023	Time	11:38
End purge time		Color	
Odor		Sheen/Product	
Remarks	Insufficient water for sampling		

5-Sample Summary

Date	09/22/2023	Time	11:38
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Insufficient water for sampling		

Photos

E11

1-Well Integrity

Date	09/22/2023	Time	10:19
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	No
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	3.57	Groundwater Elevation	
Depth Installed		Depth Measured	3.83
Well Dry?	Y	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	3.37
Well Depth (m)	3.83	Water Column in Well	0.45
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks	Well can be considered dry - thick mud only/unable to sample		

2-Initial Observations

Date	09/22/2023	Time	10:23
Purge Start Time		Color	
Odor		Sheen/Product	
Remarks	Well can be considered dry - thick mud only/unable to sample		

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/22/23	10:23												Well can be consider dry - thick mud only/ unable to sample

4-Final Observations

Date	09/22/2023	Time	10:23
End purge time		Color	
Odor		Sheen/Product	
Remarks	Well can be considered dry - thick mud only/unable to sample		

5-Sample Summary

Date	09/22/2023	Time	10:23
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Well can be considered dry - thick mud only/unable to sample		

Photos

E4

1-Well Integrity

Date	09/21/2023	Time	13:23
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)		Well Secured on initial inspection	
Is Well ID Visible?		Water in the well box	
Protective casing or sleeve around well in good condition (if no comment)		Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	2.52	Groundwater Elevation	
Depth Installed		Depth Measured	3.38
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions	Sunny, Warm, High Winds	Sampling Method	Low Flow - Peristaltic Pump
Volume Units		Water Quality Meter	Horiba
Sampling Type	Low Flow	Casing Material	PVC
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	2.52
Well Depth (m)	3.38	Water Column in Well	0.85
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	09/21/2023	Time	13:31
Purge Start Time	13:31	Color	pale brown yellow clear
Odor	no odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/21/23	13:32	0.14	500		2.60	26.92	10.2	2530	0.2	1570	-224		
09/21/23	13:35	0.14	0.42		2.63	26.66	10.2	2520	0.2	1560	-236		
09/21/23	13:38	0.14	0.42		2.65	26.46	10.2	2510	0.1	1560	-243		

4-Final Observations

Date	09/21/2023	Time	13:43
End purge time	13:37	Color	clear brown yellow
Odor	sulfidic odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	09/21/2023	Time	13:44
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth 2.67mbTOC		

Photos


Location name: 'E4', Date: 09/21/2023 13:44, Azimuth: 0.0,Latitude: -32.78859164103193 5, Longitude: 151.48637163466913

E5

1-Well Integrity

Date	09/21/2023	Time	14:33
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)		Well Secured on initial inspection	
Is Well ID Visible?		Water in the well box	
Protective casing or sleeve around well in good condition (if no comment)		Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	2.48	Groundwater Elevation	
Depth Installed		Depth Measured	2.53
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	
Well Depth (m)		Water Column in Well	
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks	Insufficient water for sampling		

2-Initial Observations

Date	09/21/2023	Time	14:33
Purge Start Time		Color	
Odor		Sheen/Product	
Remarks	Insufficient water for sampling		

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/21/23	14:33												Insufficie water for samplin

4-Final Observations

Date	09/21/2023	Time	14:33
End purge time		Color	
Odor		Sheen/Product	
Remarks	Insufficient water for sampling		

5-Sample Summary

Date	09/21/2023	Time	14:33
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Insufficient water for sampling		

Photos

E5D

1-Well Integrity

Date	09/21/2023	Time	14:34
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	No
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	2.19	Groundwater Elevation	
Depth Installed		Depth Measured	5.37
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions	Sunny, Warm, High Winds	Sampling Method	Low Flow - Peristaltic Pump
Volume Units		Water Quality Meter	Horiba
Sampling Type	Low Flow	Casing Material	PVC
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	2.19
Well Depth (m)	5.37	Water Column in Well	3.18
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	09/21/2023	Time	14:45
Purge Start Time	14:41	Color	Dark yellow clear
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/21/23	14:45	0.14	500		2.21	23.39	7.8	8530	0.6	5370	65		
09/21/23	14:48	0.14	0.42		2.27	23.41	7.8	8520	0.5	5370	63		
09/21/23	14:51	0.14	0.42		2.34	23.41	7.8	8520	0.4	5360	62		

4-Final Observations

Date	09/21/2023	Time	14:48
End purge time	14:48	Color	dark yellow clear
Odor	no odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	09/21/2023	Time	14:48
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks			

Photos


Location name: 'ESD', Date: 09/21/2023 14:50, Azimuth: 0.0,Latitude: -32.78832237239263, Longitude: 151.4858784434865

F5

1-Well Integrity

Date	09/21/2023	Time	10:32
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	No
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	3.17	Groundwater Elevation	
Depth Installed		Depth Measured	7.39
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions	Partly Sunny, Warm	Sampling Method	Low Flow - Peristaltic Pump
Volume Units		Water Quality Meter	Horiba
Sampling Type	Low Flow	Casing Material	PVC
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	3.17
Well Depth (m)	17.39	Water Column in Well	14.22
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	09/21/2023	Time	10:42
Purge Start Time	10:42	Color	pale grey brown slightly turbid
Odor	no odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/21/23	10:47	0.14	500		3.17	24.63	5.0	6360	0.3	4000	157		
09/21/23	10:50	0.14	0.42		3.19	24.64	5.0	6350	0.3	4000	159		
09/21/23	10:53	0.14	0.42		3.26	24.65	4.9	6350	0.3	4000	162		

4-Final Observations

Date	09/21/2023	Time	10:51
End purge time		Color	slightly turbid pale grey brown
Odor	no odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	09/21/2023	Time	10:51
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth 3.27mbTOC		

Photos


Location name: 'F5', Date: 09/21/2023 10:54, Azimuth: 0.0,Latitude: -32.785871252448096, Longitude: 151.49064933895272

F6

1-Well Integrity

Date	09/21/2023	Time	09:58
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	No	Water in the well box	No
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	4.47	Groundwater Elevation	
Depth Installed		Depth Measured	15.56
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions	Partly Cloudy, Warm	Sampling Method	Low Flow - Peristaltic Pump
Volume Units		Water Quality Meter	Horiba
Sampling Type	Low Flow	Casing Material	PVC
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	4.47
Well Depth (m)	15.56	Water Column in Well	11.09
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	09/21/2023	Time	09:58
Purge Start Time	10:08	Color	clear colourless
Odor	no odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/21/23	09:59	0.14	500		4.47	24.2	6.8	5380	3.9	3390	-76		
09/21/23	10:02	0.14	0.42		4.51	24.22	6.9	5360	3.8	3380	-83		
09/21/23	10:05	0.14	0.42		4.55	24.22	6.9	5350	3.8	3370	-85		

4-Final Observations

Date	09/21/2023	Time	09:59
End purge time	10:14	Color	clear colourless
Odor	no odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	09/21/2023	Time	10:14
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth to water 4.56mbtoc		

Photos


Location name: 'F6', Date: 09/21/2023 10:15, Azimuth: 0.0,Latitude: -32.78760714459492, Longitude: 151.48991885609132

G2

1-Well Integrity

Date	09/22/2023	Time	09:21
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	No
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	8.6	Groundwater Elevation	
Depth Installed		Depth Measured	13.52
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions	High Winds, Partly Cloudy, Warm	Sampling Method	Low Flow - Peristaltic Pump
Volume Units		Water Quality Meter	Horiba
Sampling Type	Low Flow	Casing Material	PVC
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	8.6
Well Depth (m)	13.52	Water Column in Well	4.92
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	09/22/2023	Time	09:26
Purge Start Time	09:26	Color	clear colourless
Odor	no odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/22/23	09:39	0.14	500		8.67	18.14	6.4	8650	0.0	5440	10	6.6	
09/22/23	09:42	0.14	0.42		8.71	18.15	6.4	8660	0.0	5450	11	8.0	
09/22/23	09:45	0.14	0.42		8.73	18.15	6.3	8660	0.0	5460	12	6.3	

4-Final Observations

Date	09/22/2023	Time	09:43
End purge time	09:43	Color	clear colourless
Odor	no odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	09/22/2023	Time	09:43
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID	DO1_20230922	Analysis	
Sample Preservation		Bottles	
Remarks			

Photos


Location name: 'G2', Date: 09/22/2023 09:49, Azimuth: 0.0,Latitude: -32.78665781024179, Longitude: 151.48669618195993

G5

1-Well Integrity

Date	09/21/2023	Time	10:40
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	No	Water in the well box	No
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	3.20	Groundwater Elevation	
Depth Installed		Depth Measured	11.34
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions	Sunny, Warm	Sampling Method	Low Flow - Peristaltic Pump
Volume Units		Water Quality Meter	Horiba
Sampling Type	Low Flow	Casing Material	PVC
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	3.20
Well Depth (m)	11.34	Water Column in Well	8.14
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	09/21/2023	Time	11:03
Purge Start Time	11:03	Color	clear colourless
Odor	no odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/21/23	11:10	0.14	500		3.25	26.97	6.1	2230	0.6	1430	77		
09/21/23	11:13	0.14	0.42		3.37	27.05	6.0	2230	0.6	1430	76		
09/21/23	11:16	0.14	0.42		3.40	27.09	6.0	2230	0.4	1430	78		

4-Final Observations

Date	09/21/2023	Time	11:12
End purge time	11:12	Color	clear colourless
Odor	no odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	09/21/2023	Time	11:13
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks			

Photos


Location name: 'GS', Date: 09/21/2023 11:15, Azimuth: 0.0,Latitude: -32.785953362864014, Longitude: 151.49058674461827

G6

1-Well Integrity

Date	09/21/2023	Time	09:38
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	No	Water in the well box	No
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	3.88	Groundwater Elevation	
Depth Installed		Depth Measured	5.89
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions	Sunny, Warm	Sampling Method	Low Flow - Peristaltic Pump
Volume Units		Water Quality Meter	Horiba
Sampling Type	Low Flow	Casing Material	PVC
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	3.88
Well Depth (m)	5.89	Water Column in Well	2.01
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	09/21/2023	Time	09:50
Purge Start Time	09:50	Color	clear colourless
Odor	sulfidic odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/21/23	09:50	0.14	500		3.88	24.01	4.7	5020	0.6	3170	161		
09/21/23	09:53	0.14	0.42		3.83	23.95	4.5	5020	0.7	3160	163		
09/21/23	09:56	0.14	0.42		3.76	23.93	4.5	5020	1.1	3160	164		
09/21/23	09:59	0.14	0.42		3.75	23.92	4.5	5020	1.2	3170	164		

4-Final Observations

Date	09/21/2023	Time	09:54
End purge time	09:55	Color	clear colourless
Odor	sulfidic odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	09/21/2023	Time	09:55
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks			

Photos


Location name: 'G6', Date: 09/21/2023 09:56, Azimuth: 0.0,Latitude: -32.78787293474449, Longitude: 151.4898104780833

N2

1-Well Integrity

Date	09/21/2023	Time	14:59
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	No
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	4.18	Groundwater Elevation	
Depth Installed		Depth Measured	5.62
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions	High Winds, Sunny, Warm	Sampling Method	Low Flow - Peristaltic Pump
Volume Units		Water Quality Meter	Horiba
Sampling Type	Low Flow	Casing Material	PVC
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	4.18
Well Depth (m)	5.62	Water Column in Well	1.44
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	09/21/2023	Time	15:05
Purge Start Time	15:05	Color	clear colourless
Odor	no odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/21/23	15:10	0.41	500		4.22	18.23	5.3	4670	4.4	2990	346		
09/21/23	15:13	0.14	0.42		4.25	18.04	4.9	4670	4.2	2990	387		
09/21/23	15:16	0.14	0.42		4.30	18.00	4.9	4670	4.4	2990	399		
09/21/23	15:19	0.14	0.42		4.33	18.00	4.9	4670	4.3	2990	407		

4-Final Observations

Date	09/21/2023	Time	15:15
End purge time		Color	clear colourless
Odor	no odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	09/21/2023	Time	15:15
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks			

Photos


Location name: 'N2', Date: 09/21/2023 15:16, Azimuth: 0.0,Latitude: -32.78723079714252, Longitude: 151.4880788607071

N8

1-Well Integrity

Date	09/22/2023	Time	08:50
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)		Well Secured on initial inspection	
Is Well ID Visible?		Water in the well box	
Protective casing or sleeve around well in good condition (if no comment)		Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	3.79	Groundwater Elevation	
Depth Installed		Depth Measured	5.20
Well Dry?		Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions	High Winds, Partly Cloudy, Warm	Sampling Method	Low Flow - Peristaltic Pump
Volume Units		Water Quality Meter	Horiba
Sampling Type	Low Flow	Casing Material	PVC
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	3.79
Well Depth (m)	5.20	Water Column in Well	1.41
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	09/22/2023	Time	08:56
Purge Start Time	08:56	Color	cloudy brown yellow
Odor	no odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/22/23	08:58	0.14	500		3.88	18.64	7.1	1280	0.0	7940	-90	449	
09/22/23	09:01	0.14	0.42		3.90	18.60	7.1	1280	0.0		7950	473	
09/22/23	09:04	0.14	0.42		3.92	18.56	7.0	1280	0.0	7970	-91	461	

4-Final Observations

Date	09/22/2023	Time	09:04
End purge time		Color	cloudy yellow brown
Odor	no odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	09/22/2023	Time	09:05
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks			

Photos


www.envirolab.com.au
Sampled by: ME
Sample ID: N3
MAJOR TESTS:
Sample ID: N2
MAJOR TESTS: Cyanides
Location name: 'N8', Date: 09/22/2023 09:08, Azimuth: 0.0,Latitude: -32.78644286007719, Longitude: 151.48737605298646

N9

1-Well Integrity

Date	09/22/2023	Time	08:20
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	No	Water in the well box	No
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	2.68	Groundwater Elevation	
Depth Installed		Depth Measured	2.80
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions	High Winds, Partly Cloudy, Warm	Sampling Method	Low Flow - Peristaltic Pump
Volume Units		Water Quality Meter	Horiba
Sampling Type	Low Flow	Casing Material	PVC
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	2.68
Well Depth (m)	2.80	Water Column in Well	0.11
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	09/22/2023	Time	08:24
Purge Start Time	08:24	Color	Dark brown turbid
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/22/23	08:25	0.14	500			18.15	8.9	14400	2.3	8900	-142	1000	Well purged dry, after 1 round of paramet taken, flow was stopped and readings samples from flow cell were taken

4-Final Observations

Date	09/22/2023	Time	08:33
End purge time		Color	dark brown turbid
Odor	no odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	09/22/2023	Time	08:33
Did Well Dewater?	Yes	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	not field filtered due to high turbidity		

Photos


Location name: 'N9', Date: 09/22/2023 08:37, Azimuth: 0.0,Latitude: -32.7865393739499, Longitude: 151.48765959791046

W1D

1-Well Integrity

Date	09/22/2023	Time	10:40
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	No
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	2.67	Groundwater Elevation	
Depth Installed		Depth Measured	10.38
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions	High Winds, Partly Sunny, Warm	Sampling Method	Low Flow - Peristaltic Pump
Volume Units		Water Quality Meter	Horiba
Sampling Type	Low Flow	Casing Material	PVC
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	2.67
Well Depth (m)	10.38	Water Column in Well	7.71
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	09/22/2023	Time	10:54
Purge Start Time	10:52	Color	clear yellow orange
Odor	no odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/22/23	10:55	0.14	500		2.72	19.50	7.9	1650	0.0	10300	60	28.4	
09/22/23	10:58	0.14	0.42		2.76	19.51	8.0	1660	0.0	10300	56	29.5	
09/22/23	11:01	0.14	0.42		2.78	19.54	8.0	1670	0.0	10300	51	28.5	

4-Final Observations

Date	09/22/2023	Time	10:58
End purge time	10:58	Color	clear orange yellow
Odor	no odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	09/22/2023	Time	10:58
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks			

Photos


Location name: 'W1D', Date: 09/22/2023 11:02, Azimuth: 0.0,Latitude: -32.78863430491908, Longitude: 151.48625412038666

W1S

1-Well Integrity

Date	09/21/2023	Time	13:51
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)		Well Secured on initial inspection	
Is Well ID Visible?		Water in the well box	
Protective casing or sleeve around well in good condition (if no comment)		Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	2.10	Groundwater Elevation	
Depth Installed		Depth Measured	2.33
Well Dry?		Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	
Well Depth (m)		Water Column in Well	
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks	Insufficient water for sampling		

2-Initial Observations

Date	09/21/2023	Time	13:53
Purge Start Time		Color	
Odor		Sheen/Product	
Remarks	Insufficient water for sampling		

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/21/23	13:54												Insufficie water for samplin

4-Final Observations

Date	09/21/2023	Time	13:54
End purge time		Color	
Odor		Sheen/Product	
Remarks	Insufficient water for sampling		

5-Sample Summary

Date	09/21/2023	Time	13:54
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Insufficient water for sampling		

Photos

W2D

1-Well Integrity

Date	09/22/2023	Time	11:10
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	No
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	2.59	Groundwater Elevation	
Depth Installed		Depth Measured	6.37
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions	High Winds, Partly Cloudy	Sampling Method	Low Flow - Peristaltic Pump
Volume Units		Water Quality Meter	Horiba
Sampling Type	Low Flow	Casing Material	PVC
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	2.59
Well Depth (m)	6.37	Water Column in Well	3.78
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	09/22/2023	Time	11:12
Purge Start Time	11:12	Color	clear brown yellow
Odor	no odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/22/23	11:21	0.14	500		2.64	18.76	10.6	4290	0.0	2620	-146	22.0	
09/22/23	11:24	0.14	0.42		2.66	18.72	10.6	4290	0.0	2620	-141	20.3	
09/22/23	11:27	0.14	0.42		2.73	18.68	10.6	4290	0.0	2610	-140	18.5	

4-Final Observations

Date	09/22/2023	Time	11:23
End purge time		Color	clear brown yellow
Odor	no odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	09/22/2023	Time	11:23
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks			

Photos


Location name: 'W2D', Date: 09/22/2023 11:24, Azimuth: 0.0,Latitude: -32.78890566786035, Longitude: 151.4858779784019

W2S

1-Well Integrity

Date	09/22/2023	Time	11:09
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)		Well Secured on initial inspection	
Is Well ID Visible?		Water in the well box	
Protective casing or sleeve around well in good condition (if no comment)		Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	2.37	Groundwater Elevation	
Depth Installed		Depth Measured	2.37
Well Dry?	Y	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	2.37
Well Depth (m)	2.37	Water Column in Well	0.0
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks	Well dry		

2-Initial Observations

Date	09/22/2023	Time	11:10
Purge Start Time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/22/23	11:10												Well dry

4-Final Observations

Date	09/22/2023	Time	11:10
End purge time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

5-Sample Summary

Date	09/22/2023	Time	11:10
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Well dry		

Photos

W3S

1-Well Integrity

Date	09/22/2023	Time	11:49
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	No
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	2.00	Groundwater Elevation	
Depth Installed		Depth Measured	2.53
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	2.00
Well Depth (m)	2.53	Water Column in Well	0.52
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	09/22/2023	Time	11:57
Purge Start Time	11:55	Color	cloudy brown yellow
Odor	no odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/22/23	12:00	0.14	500		2.04	19.02	8.4	13600	0.0	8400	261	206	
09/22/23	12:03	0.14	0.42		2.05	19.01	8.3	13500	0.0	8360	261	139	
09/22/23	12:06	0.14	0.42		2.10	19.00	8.3	13500	0.0	8340	261	118	

4-Final Observations

Date	09/22/2023	Time	12:03
End purge time	12:03	Color	cloudy brown yellow
Odor	no odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	09/22/2023	Time	12:03
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks			

Photos


Location name: 'W3S', Date: 09/22/2023 12:06, Azimuth: 0.0,Latitude: -32.787428864819226, Longitude: 151.48661583358341

W4S

1-Well Integrity

Date	09/22/2023	Time	10:33
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	No
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW		Groundwater Elevation	
Depth Installed		Depth Measured	
Well Dry?	Y	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	
Well Depth (m)		Water Column in Well	
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks	Well dry		

2-Initial Observations

Date	09/22/2023	Time	10:33
Purge Start Time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/22/23	10:33												Well dry

4-Final Observations

Date	09/22/2023	Time	10:33
End purge time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

5-Sample Summary

Date	09/22/2023	Time	10:33
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Well dry		

Photos

W5D

1-Well Integrity

Date	09/21/2023	Time	08:48
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	No
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	5.41	Groundwater Elevation	
Depth Installed		Depth Measured	10.62
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions	Warm, Partly Cloudy	Sampling Method	Low Flow - Peristaltic Pump
Volume Units		Water Quality Meter	Horiba
Sampling Type	Low Flow	Casing Material	PVC
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	5.41
Well Depth (m)	10.62	Water Column in Well	5.2
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	09/21/2023	Time	08:51
Purge Start Time	08:59	Color	
Odor		Sheen/Product	NA
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/21/23	09:10	0.14	500		5.42	23.60	6.7	3790	0.7	2430	20		
09/21/23	09:13	0.14	0.42		6.04	23.43	6.6	3800	0.6	2430	20		
09/21/23	09:16	0.14	0.42		6.06	23.36	6.6	3800	0.6	2430	20		

4-Final Observations

Date	09/21/2023	Time	09:13
End purge time	09:18	Color	slightly turbid pale yellow brown
Odor	no odour	Sheen/Product	NO
Remarks	Final depth to water 6.08mbTOC		

5-Sample Summary

Date	09/21/2023	Time	09:13
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks			

Photos


ENVIROLAB
Project: 318001662
Sample ID: WSD
MAJOR TESTS:
www.envirolab.com.au
Date: 21/09/23
Sampled by: ME
Location name: 'WSD', Date: 09/21/2023 09:16, Azimuth: 0.0,Latitude: -32.787108630903795, Longitude: 151.48735164678794

W5S

1-Well Integrity

Date	09/21/2023	Time	08:42
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW		Groundwater Elevation	
Depth Installed		Depth Measured	
Well Dry?	Y	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions	Partly Cloudy, Warm	Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	
Well Depth (m)		Water Column in Well	
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	09/21/2023	Time	08:48
Purge Start Time		Color	
Odor		Sheen/Product	NA
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/21/23	08:48												Well dry

4-Final Observations

Date	09/21/2023	Time	08:48
End purge time		Color	
Odor		Sheen/Product	NA
Remarks			

5-Sample Summary

Date	09/21/2023	Time	08:48
Did Well Dewater?	NA	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Well dry		

Photos

W6D

1-Well Integrity

Date	09/22/2023	Time	07:40
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	No
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	5.36	Groundwater Elevation	
Depth Installed		Depth Measured	8.77
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions	High Winds, Sunny, Warm	Sampling Method	Low Flow - Peristaltic Pump
Volume Units		Water Quality Meter	Horiba
Sampling Type	Low Flow	Casing Material	PVC
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	5.36
Well Depth (m)	8.77	Water Column in Well	3.4
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	09/22/2023	Time	07:55
Purge Start Time	07:55	Color	Turbid brown/grey
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/22/23	07:55	0.14	500		5.41	18.07	6.5	1420	0.3	908	28	1000	
09/22/23	07:58	0.14	0.42		5.42	18.07	6.3	1420	0.2	907	40	1000	
09/22/23	08:01	0.14	0.42		5.30	18.09	6.3	1410	0.2	900	60	1000	
09/22/23	08:04	0.14	0.42		5.34	18.10	6.3	1410	0.3	899	64	1000	

4-Final Observations

Date	09/22/2023	Time	08:01
End purge time	08:01	Color	cloudy pale yellow brown
Odor	no odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	09/22/2023	Time	08:01
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks			

Photos


Location name: 'W6D', Date: 09/22/2023 08:07, Azimuth: 0.0,Latitude: -32.7864647315974, Longitude: 151.487534259800

W6S

1-Well Integrity

Date	09/22/2023	Time	08:12
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	No	Water in the well box	No
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW		Groundwater Elevation	
Depth Installed		Depth Measured	
Well Dry?	Y	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	
Well Depth (m)		Water Column in Well	
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks	Well dry		

2-Initial Observations

Date	09/22/2023	Time	08:13
Purge Start Time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/22/23	08:13												Well dry

4-Final Observations

Date	09/22/2023	Time	08:13
End purge time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

5-Sample Summary

Date	09/22/2023	Time	08:13
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Well dry		

Photos

W7M

1-Well Integrity

Date	09/21/2023	Time	14:02
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	No
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	2.87	Groundwater Elevation	
Depth Installed		Depth Measured	3.76
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions	Sunny, Warm, High Winds	Sampling Method	Low Flow - Peristaltic Pump
Volume Units		Water Quality Meter	Horiba
Sampling Type	Low Flow	Casing Material	PVC
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	2.87
Well Depth (m)	3.76	Water Column in Well	0.88
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	09/21/2023	Time	14:10
Purge Start Time	14:07	Color	clear brown
Odor	no odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/21/23	14:13	0.14	500		2.92	26.26	10.2	1900	0.1	1170	-247		
09/21/23	14:16	0.14	0.42		2.98	26.18	10.4	1900	0.0	1180	-247		
09/21/23	14:13	0.14	-0.42		3.06	26.09	10.4	1900	0.0	1180	-250		3 minute intervals ditched due to risk of purging well dry

4-Final Observations

Date	09/21/2023	Time	14:16
End purge time	14:16	Color	brown clear
Odor	no odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	09/21/2023	Time	14:19
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks			

Photos


Location name: 'W7M', Date: 09/21/2023 14:19, Azimuth: 0.0,Latitude: -32.78850342150105 5, Longitude: 151.48590526557666

W7S

1-Well Integrity

Date	09/21/2023	Time	14:01
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)		Well Secured on initial inspection	
Is Well ID Visible?		Water in the well box	
Protective casing or sleeve around well in good condition (if no comment)		Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW		Groundwater Elevation	
Depth Installed		Depth Measured	
Well Dry?	Y	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	
Well Depth (m)		Water Column in Well	
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks	Well dry		

2-Initial Observations

Date	09/21/2023	Time	14:03
Purge Start Time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
09/21/23	14:03												Well dry

4-Final Observations

Date	09/21/2023	Time	14:03
End purge time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

5-Sample Summary

Date	09/21/2023	Time	14:03
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Well dry		

Photos

A7

1-Well Integrity

Date	11/28/2023	Time	09:07
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	4.23	Groundwater Elevation	
Depth Installed		Depth Measured	4.29
Well Dry?		Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	4.23
Well Depth (m)	4.29	Water Column in Well	
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks	Insufficient water for sampling		

2-Initial Observations

Date	11/28/2023	Time	10:35
Purge Start Time		Color	
Odor		Sheen/Product	
Remarks	Insufficient water for sampling		

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/28/23	10:35												Insufficie water for samplin

4-Final Observations

Date	11/28/2023	Time	10:35
End purge time		Color	
Odor		Sheen/Product	
Remarks	tInsufficient water for sampling		

5-Sample Summary

Date	11/28/2023	Time	10:36
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Insufficient water for sampling		

Photos

E11

1-Well Integrity

Date	11/27/2023	Time	12:31
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	3.05	Groundwater Elevation	
Depth Installed		Depth Measured	3.05
Well Dry?	Y	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	3.05
Well Depth (m)	3.05	Water Column in Well	0.0
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks	Thick grey silt		

2-Initial Observations

Date	11/27/2023	Time	12:32
Purge Start Time		Color	
Odor		Sheen/Product	
Remarks	Insufficient water for sampling		

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/28/23	09:45												Insufficie water for samplin

4-Final Observations

Date	11/28/2023	Time	09:45
End purge time		Color	
Odor		Sheen/Product	
Remarks	Insufficient water for sampling		

5-Sample Summary

Date	11/28/2023	Time	09:45
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Insufficient water for sampling		

Photos

E4

1-Well Integrity

Date	11/28/2023	Time	11:15
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	No	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	2.79	Groundwater Elevation	
Depth Installed		Depth Measured	3.41
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	2.79
Well Depth (m)	3.41	Water Column in Well	0.62
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date		Time	
Purge Start Time		Color	
Odor		Sheen/Product	
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/28/23	11:38					22.78	9.8	2710	0.0	1680	-198	759	

4-Final Observations

Date		Time	
End purge time		Color	
Odor		Sheen/Product	
Remarks			

5-Sample Summary

Date		Time	
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks			

Photos

E5

1-Well Integrity

Date	11/28/2023	Time	09:44
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW		Groundwater Elevation	
Depth Installed		Depth Measured	2.57
Well Dry?	Y	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	
Well Depth (m)	2.57	Water Column in Well	
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks	Well dry		

2-Initial Observations

Date	11/28/2023	Time	09:44
Purge Start Time		Color	
Odor		Sheen/Product	NA
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/28/23	09:44												Well dry

4-Final Observations

Date	11/28/2023	Time	09:44
End purge time		Color	
Odor		Sheen/Product	NA
Remarks	Well dry		

5-Sample Summary

Date	11/28/2023	Time	09:44
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Well dry		

Photos

E5D

1-Well Integrity

Date	11/28/2023	Time	09:19
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	2.42	Groundwater Elevation	
Depth Installed		Depth Measured	5.44
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	2.42
Well Depth (m)	5.44	Water Column in Well	
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	11/28/2023	Time	09:21
Purge Start Time	09:24	Color	
Odor		Sheen/Product	
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/28/23	09:32	0.14	500		2.44	21.66	7.2	1350	0.0	8370	-79	851	
11/28/23	09:35	0.14	0.42		2.47	21.69	7.2	1350	0.0	8370	-80	845	
11/28/23	09:38	0.14	0.42		2.53	21.66	7.2	1350	0.0	8360	-79	840	

4-Final Observations

Date	11/28/2023	Time	09:38
End purge time		Color	Cloudy yellow
Odor	No odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	11/28/2023	Time	09:39
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth to water 2.58mbtoc		

Photos

F5

1-Well Integrity

Date	11/27/2023	Time	13:41
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	3.34	Groundwater Elevation	
Depth Installed		Depth Measured	7.36
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	3.34
Well Depth (m)	7.36	Water Column in Well	4.02
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	11/27/2023	Time	13:53
Purge Start Time	13:47	Color	
Odor		Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/27/23	13:54	0.14	500		3.37	24.07	4.3	9540	0.0	6010	183	0.5	
11/27/23	13:57	0.14	0.42		3.41	24.11	4.3	9540	0.0	6010	182	0.4	
11/27/23	14:00	0.14	0.42		3.43	24.10	4.3	9580	0.0	6040	181	0.6	

4-Final Observations

Date	11/27/2023	Time	13:56
End purge time		Color	Clear colourless
Odor	No odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	11/27/2023	Time	13:56
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks			

Photos

F6

1-Well Integrity

Date	11/27/2023	Time	14:37
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	No	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	4.65	Groundwater Elevation	
Depth Installed		Depth Measured	15.48
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	4.65
Well Depth (m)	15.48	Water Column in Well	
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	11/27/2023	Time	14:44
Purge Start Time	14:42	Color	
Odor		Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/27/23	14:44	0.14	500		4.69	24.34	6.5	8620	3.1	5420	-15	2.9	
11/27/23	14:47	0.14	0.42		4.78	24.13	6.9	8590	2.7	5410	-24	1.1	
11/27/23	14:50	0.14	0.42		4.80	24.03	7.0	8590	2.7	5420	-22	1.1	
11/27/23	14:53	0.14	0.42		4.84	23.86	7.1	8620	2.7	5430	-18	1.0	
11/27/23	14:56	0.14	500		4.86	23.72	7.1	8660	2.7	5450	-11	0.7	

4-Final Observations

Date	11/27/2023	Time	14:46
End purge time	14:50	Color	Clear colourless
Odor	No odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	11/27/2023	Time	14:46
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks			

Photos

G2

1-Well Integrity

Date	11/27/2023	Time	11:52
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	8.14	Groundwater Elevation	
Depth Installed		Depth Measured	13.36
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	8.14
Well Depth (m)	13.36	Water Column in Well	5.21
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	11/27/2023	Time	11:55
Purge Start Time	11:57	Color	
Odor		Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/27/23	12:00	0.14	500		8.14	27.47	6.8	5320	0.5	3340	78	53.6	
11/27/23	12:03	0.14	0.42		8.23	26.90	6.5	5260	0.0	3310	81	51.5	
11/27/23	12:06	0.14	0.42		8.30	26.32	6.3	5220	0.0	3290	84	51.3	
11/27/23	12:09	0.14	0.42		8.34	25.85	6.3	5250	0.0	3310	84	52.2	
11/27/23	12:12	0.14	0.42		8.39	25.66	6.2	5230	0.0	3300	85	53.3	

4-Final Observations

Date	11/27/2023	Time	12:11
End purge time		Color	Slightly cloudy yellow brown
Odor	No odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	11/27/2023	Time	12:12
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID	D01_20231127, T01_20231127	Analysis	
Sample Preservation		Bottles	
Remarks			

Photos

G5

1-Well Integrity

Date	11/27/2023	Time	13:58
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	3.33	Groundwater Elevation	
Depth Installed		Depth Measured	11.27
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	3.33
Well Depth (m)	11.27	Water Column in Well	7.93
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	11/27/2023	Time	14:04
Purge Start Time	14:04	Color	
Odor		Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/27/23	14:06	0.14	500		3.35	20.35	6.1	1600	0.0	1010	18	1.3	
11/27/23	14:09	0.14	0.42		3.37	20.44	6.2	1510	0.0	956	11	1.0	
11/27/23	14:12	0.14	0.42		3.41	20.45	6.2	1370	0.0	876	5	0.7	

4-Final Observations

Date	11/27/2023	Time	14:07
End purge time		Color	Clear colourless
Odor	No odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	11/27/2023	Time	14:10
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth 4.06mbtoc		

Photos

G6

1-Well Integrity

Date	11/27/2023	Time	14:18
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	No	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	4.21	Groundwater Elevation	
Depth Installed		Depth Measured	6.16
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	4.21
Well Depth (m)	6.16	Water Column in Well	1.95
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	11/27/2023	Time	14:19
Purge Start Time	14:26	Color	
Odor		Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/27/23	14:26	0.14	500		4.23	23.37	4.0	7600	0.0	4880	166	0.4	
11/27/23	14:29	0.14	0.42		4.26	22.92	4.0	7810	0.0	4930	164	0.3	
11/27/23	14:32	0.14	0.42		4.27	22.50	4.0	7910	0.0	4990	160	0.3	

4-Final Observations

Date	11/27/2023	Time	14:27
End purge time	14:30	Color	Clear colourless
Odor	Sulphidic odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	11/27/2023	Time	14:30
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth to water 4.26mbtoc		

Photos

N2

1-Well Integrity

Date	11/27/2023	Time	13:11
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	4.37	Groundwater Elevation	
Depth Installed		Depth Measured	5.62
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	4.37
Well Depth (m)	5.62	Water Column in Well	1.25
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	11/27/2023	Time	13:17
Purge Start Time	13:17	Color	
Odor		Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/27/23	13:19	0.14	500		4.41	21.07	4.2	6700	4.4	4220	388	365	
11/27/23	13:22	0.14	0.42		4.45	20.77	4.0	6720	4.2	4230	410	256	
11/27/23	13:25	0.14	0.42		4.47	20.71	4.0	6720	4.1	4230	426	231	
11/27/23	13:28	0.14	0.42		4.50	20.65	4.0	6730	4.1	4240	428	251	

4-Final Observations

Date	11/27/2023	Time	13:28
End purge time		Color	Clear colourless
Odor	No odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	11/27/2023	Time	13:29
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks			

Photos

N8

1-Well Integrity

Date	11/27/2023	Time	11:25
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	3.73	Groundwater Elevation	
Depth Installed		Depth Measured	5.17
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	3.73
Well Depth (m)	5.17	Water Column in Well	1.44
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	11/27/2023	Time	11:28
Purge Start Time	11:28	Color	Slightly cloudy yellow brown
Odor	Sulphidic odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/27/23	11:34	0.14	500		3.77	29.91	6.8	8150	0.1	5120	-101	70.1	
11/27/23	11:37	0.14	0.42		3.80	30.67	6.9	7980	0.0	5030	-105	68.1	
11/27/23	11:40	0.14	0.42		3.82	30.86	6.9	7960	0.0	5010	-107	68.1	

4-Final Observations

Date	11/27/2023	Time	11:38
End purge time		Color	Cloudy brown yellow
Odor	Sulphidic odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	11/27/2023	Time	11:39
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth to water 4.34mbtoc		

Photos

N9

1-Well Integrity

Date	11/27/2023	Time	11:23
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	No	Water in the well box	
Protective casing or sleeve around well in good condition (if no comment)		Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	2.85	Groundwater Elevation	
Depth Installed		Depth Measured	2.85
Well Dry?	Y	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	2.85
Well Depth (m)	2.85	Water Column in Well	0.0
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks	Well dry		

2-Initial Observations

Date	11/28/2023	Time	09:46
Purge Start Time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/28/23	09:46												Well dry

4-Final Observations

Date	11/28/2023	Time	09:46
End purge time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

5-Sample Summary

Date	11/28/2023	Time	09:46
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Well dry		

Photos

W1D

1-Well Integrity

Date	11/28/2023	Time	08:33
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	2.55	Groundwater Elevation	
Depth Installed		Depth Measured	10.40
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	2.55
Well Depth (m)	10.40	Water Column in Well	
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	11/28/2023	Time	08:34
Purge Start Time	08:34	Color	
Odor		Sheen/Product	
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/28/23	08:38	0.14	500		2.57	20.26	7.6	1290	0.5	8000	-94	91.5	
11/28/23	08:41	0.14	0.42		2.61	20.34	7.5	1280	0.0	7940	-102	125	
11/28/23	08:44	0.14	0.42		2.65	20.34	7.5	1280	0.0	7920	-107	115	

4-Final Observations

Date	11/28/2023	Time	08:41
End purge time	08:47	Color	
Odor		Sheen/Product	
Remarks			

5-Sample Summary

Date	11/28/2023	Time	08:47
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth 3.21mbtoc		

Photos

W1S

1-Well Integrity

Date	11/28/2023	Time	08:16
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)		Well Secured on initial inspection	
Is Well ID Visible?		Water in the well box	
Protective casing or sleeve around well in good condition (if no comment)		Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	2.09	Groundwater Elevation	
Depth Installed		Depth Measured	2.42
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	2.09
Well Depth (m)	2.42	Water Column in Well	
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	11/28/2023	Time	08:21
Purge Start Time	08:21	Color	
Odor		Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/28/23	08:21	0.14	500		2.10	21.42	7.7	13.4	1.2	8320	-98	1000	

4-Final Observations

Date	11/28/2023	Time	08:26
End purge time	08:25	Color	Cloudy brown
Odor	No odour	Sheen/Product	YES
Remarks			

5-Sample Summary

Date	11/28/2023	Time	08:27
Did Well Dewater?	Yes	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Only one set of parameters taken due to well dewatering		

Photos

W2D

1-Well Integrity

Date	11/28/2023	Time	10:06
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	2.84	Groundwater Elevation	
Depth Installed		Depth Measured	6.36
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	2.84
Well Depth (m)	6.36	Water Column in Well	
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	11/28/2023	Time	10:08
Purge Start Time	10:08	Color	Clear brown
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/28/23	10:22		0.14	500	2.94	22.05	10.2	3460	0.0	2110	-220	12.8	

4-Final Observations

Date	11/28/2023	Time	10:22
End purge time	10:22	Color	
Odor		Sheen/Product	
Remarks			

5-Sample Summary

Date	11/28/2023	Time	10:23
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	One set of parameters taken due to leak in flow cell		

Photos

W2S

1-Well Integrity

Date	11/28/2023	Time	10:04
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	2.37	Groundwater Elevation	
Depth Installed		Depth Measured	2.37
Well Dry?	Y	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	2.37
Well Depth (m)	2.37	Water Column in Well	
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks	Well dry		

2-Initial Observations

Date	11/28/2023	Time	10:05
Purge Start Time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/28/23	10:05												Well dry

4-Final Observations

Date	11/28/2023	Time	10:05
End purge time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

5-Sample Summary

Date	11/28/2023	Time	10:05
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Well dry		

Photos

W3S

1-Well Integrity

Date	11/28/2023	Time	10:45
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	2.16	Groundwater Elevation	
Depth Installed		Depth Measured	2.53
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	2.16
Well Depth (m)	2.53	Water Column in Well	0.36
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	11/28/2023	Time	10:48
Purge Start Time	10:49	Color	Clear yellow brown
Odor	No odour	Sheen/Product	
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/28/23	11:00	0.14	500		2.24	21.54	8.4	1130	4.0	7030	259	96.8	

4-Final Observations

Date	11/28/2023	Time	11:01
End purge time		Color	
Odor		Sheen/Product	NO
Remarks			

5-Sample Summary

Date	11/28/2023	Time	11:01
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	One set of parameters taken due to leak in flow cell		

Photos

W4S

1-Well Integrity

Date	11/28/2023	Time	10:37
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	No	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	1.11	Groundwater Elevation	
Depth Installed		Depth Measured	1.11
Well Dry?	Y	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	1.11
Well Depth (m)	1.11	Water Column in Well	0.0
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks	Well dry		

2-Initial Observations

Date	11/28/2023	Time	10:37
Purge Start Time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/28/23	10:37												Well dry

4-Final Observations

Date	11/28/2023	Time	10:37
End purge time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

5-Sample Summary

Date	11/28/2023	Time	10:38
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Well dry		

Photos

W5D

1-Well Integrity

Date	11/27/2023	Time	12:36
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)		Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	5.5	Groundwater Elevation	
Depth Installed		Depth Measured	10.62
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	5.5
Well Depth (m)	10.62	Water Column in Well	5.11
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	11/27/2023	Time	12:38
Purge Start Time	12:41	Color	
Odor		Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/27/23	12:39	0.14	500		5.60	21.82	6.4	5980	3.2	3760	131	17.1	
11/27/23	12:42	0.14	0.42		5.65	21.42	6.3	5970	2.4	3770	136	17.2	
11/27/23	12:45	0.14	0.42		5.69	21.03	6.3	5980	2.2	3770	137	20.3	

4-Final Observations

Date	11/27/2023	Time	12:59
End purge time		Color	Clear colourless
Odor	No odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	11/27/2023	Time	13:03
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth 6.86mbtoc		

Photos

W5S

1-Well Integrity

Date	11/27/2023	Time	12:35
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	1.27	Groundwater Elevation	
Depth Installed		Depth Measured	1.27
Well Dry?	Y	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	
Well Depth (m)		Water Column in Well	
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks	Well dry		

2-Initial Observations

Date	11/28/2023	Time	09:46
Purge Start Time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/28/23	09:47												Well dry

4-Final Observations

Date	11/28/2023	Time	09:47
End purge time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

5-Sample Summary

Date	11/28/2023	Time	09:47
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Well dry		

Photos

W6D

1-Well Integrity

Date	11/27/2023	Time	10:56
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	5.38	Groundwater Elevation	
Depth Installed		Depth Measured	
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions	Sunny, Hot	Sampling Method	Low Flow - Peristaltic Pump
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	5.38
Well Depth (m)	8.80	Water Column in Well	3.42
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks			

2-Initial Observations

Date	11/27/2023	Time	11:06
Purge Start Time	11:04	Color	Clear colourless
Odor	No odour	Sheen/Product	NO
Remarks			

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/27/23	11:06	0.14	500		5.38	30.05	6.3	1170	2.6	745	173	70.6	
11/27/23	11:09	0.14	0.42		5.40	30.12	6.0	1130	2.3	720	181	68.6	
11/27/23	11:12	0.14	0.42		5.41	30.12	5.9	1110	2.1	711	184	66.6	
11/27/23	11:15	0.14	0.42		5.41	30.10	5.8	1090	2.0	698	186	68.3	
11/27/23	11:14	0.14	-0.14		5.53	30.09	5.8	1070	2.0	680	188	65.1	

4-Final Observations

Date	11/27/2023	Time	11:15
End purge time	11:17	Color	Clear colourless
Odor	No odour	Sheen/Product	NO
Remarks			

5-Sample Summary

Date	11/27/2023	Time	11:20
Did Well Dewater?	No	Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Final depth to water 5.63		

Photos

W6S

1-Well Integrity

Date	11/27/2023	Time	10:54
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW		Groundwater Elevation	
Depth Installed		Depth Measured	
Well Dry?	Y	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	3.00
Well Depth (m)	3.11	Water Column in Well	0.1
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks	Well dry		

2-Initial Observations

Date	11/27/2023	Time	10:55
Purge Start Time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/27/23	10:55												Well dry

4-Final Observations

Date	11/27/2023	Time	10:55
End purge time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

5-Sample Summary

Date	11/28/2023	Time	09:47
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Well dry		

Photos

W7M

1-Well Integrity

Date	11/28/2023	Time	09:55
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	3.25	Groundwater Elevation	
Depth Installed		Depth Measured	3.81
Well Dry?	N	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	3.25
Well Depth (m)	3.81	Water Column in Well	
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks	Insufficient water for sampling		

2-Initial Observations

Date	11/28/2023	Time	09:57
Purge Start Time		Color	
Odor		Sheen/Product	
Remarks	Insufficient water for sampling		

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/28/23	09:57												Insufficie water for samplin

4-Final Observations

Date	11/28/2023	Time	09:57
End purge time		Color	
Odor		Sheen/Product	
Remarks	Insufficient water for sampling		

5-Sample Summary

Date	11/28/2023	Time	09:57
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Insufficient water for sampling		

Photos

W7S

1-Well Integrity

Date	11/28/2023	Time	09:54
Well Integrity		Type of well head	
Is well accessible? (add comment/picture)	Yes	Well Secured on initial inspection	Yes
Is Well ID Visible?	Yes	Water in the well box	NA
Protective casing or sleeve around well in good condition (if no comment)	NA	Any cleanup performed (explain)	
Any repairs/replacement (explain)		Gauging	
PID		Reference Elevation	
DTW	2.30	Groundwater Elevation	
Depth Installed		Depth Measured	2.30
Well Dry?	Y	Free Product?	
NAPL Start Depth		NAPL End Depth	
NAPL Thickness		Wellhead	
Weather Conditions		Sampling Method	
Volume Units		Water Quality Meter	
Sampling Type		Casing Material	
Casing Diameter (mm)		Screen Interval	
Pump Intake Depth		Depth to Water (m)	2.30
Well Depth (m)	2.30	Water Column in Well	0.0
Volume in Well		Correction	
Total Volume to Remove		Coordinates	
Remarks	Well dry		

2-Initial Observations

Date	11/28/2023	Time	09:54
Purge Start Time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

3-Field Parameters

Date	Time	Flow Rate (ml/min)	Purge Volume (ml)	Cuml Vol Purged (ml)	Depth to Water (m btoc)	Tempera (C)	pH	Spec Cond (uS/cm)	Dissolve Oxygen (mg/L)	TDS (mg/L)	ORP (mV)	Turbidity (NTU)	Remarks
11/28/23	09:54												Well dry

4-Final Observations

Date	11/28/2023	Time	09:54
End purge time		Color	
Odor		Sheen/Product	
Remarks	Well dry		

5-Sample Summary

Date	11/28/2023	Time	09:55
Did Well Dewater?		Sample Date	
Sample Time		Sample ID	
QC Sample ID		Analysis	
Sample Preservation		Bottles	
Remarks	Well dry		

Photos

APPENDIX 5
LABORATORY REPORTS

COC 24/3/23 15:27

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP

Client: Ramboll	Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001662
Contact person: Jake Bourke	PO No.:
Project Mgr: Jordyn Kirsch	Envirolab Quote No. :
Sampler: Jake Bourke	Date results required:
Address: Level 2 Suite 18, 50 Glebe Road, The Junction	Or choose: standard / same day / 1 day / 2 day / 3 day
Phone: (02) 49625444 Mob: 0467580473	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*
Fax:	Lab comments: Highly contaminated
Email: jkirsch@ramboll.com; jbourke@ramboll.com	

Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Phone: 02 9910 6200 Fax :02 9910 6201
E-mail: ahie@envirolabservices.com.au
Contact: Aileen Hie

Envirolab Services WA t/a MPL
16-18 Hayden Crt, Myaree WA 6154
Phone: 08 9317 2505 Fax :08 9317 4163
E-mail: lab@mpl.com.au
Contact: Joshua Lim

Sample information					Tests Required												Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium								Provide as much information about the sample as you can
1	W2D_20230323		23/03/2023	WATER	X	X	X	X	X								
2	W7M_20230323		23/03/2023	WATER	X	X	X	X	X								
3	E5_20230323		23/03/2023	WATER	X	X	X	X	X								
4	E5D_20230323		23/03/2023	WATER	X	X	X	X	X								
5	F5_20230323		23/03/2023	WATER	X	X	X	X	X								
6	G5_20230323		23/03/2023	WATER	X	X	X	X	X								
7	F6_20230323		23/03/2023	WATER	X	X	X	X	X								
8	G6_20230323		23/03/2023	WATER	X	X	X	X	X								
9	N8_20230324		24/03/2023	WATER	X	X	X	X	X								
10	N9_20230324		24/03/2023	WATER	X	X	X	X	X								
11	W6D_20230324		24/03/2023	WATER	X	X	X	X	X								
12	E11_20230324		24/03/2023	WATER	X	X	X	X	X								
13	W5D_20230324		24/03/2023	WATER	X	X	X	X	X								
14	N2_20230324		24/03/2023	WATER	X	X	X	X	X								

Relinquished by (company):	Ramboll	Received by (company):	EM SLC
Print Name:	Jake Bourke	Print Name:	CNN
Date & Time:	24/03/2023	Date & Time:	28/3 9:00
Signature:		Signature:	

Lab use only:
Samples Received: Cool or Ambient (circle one) 319625
Temperature Received at: 12 (if applicable)
Transported by: Hand delivered / courier

ENVIROLAB GROUP

Client: Ramboll	Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001662
Contact person: Jake Bourke	PO No.:
Project Mgr: Jordyn Kirsch	Envirolab Quote No. :
Sampler: Jake Bourke	Date results required:
Address: Level 2 Suite 18, 50 Glebe Road, The Junction	Or choose: standard / same day / 1 day / 2 day / 3 day
Phone: (02) 49625444 Mob: 0467580473	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*
Fax:	Lab comments: Highly contaminated
Email: jkirsch@ramboll.com; jbourke@ramboll.com	

Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Phone: 02 9910 6200 Fax :02 9910 6201
E-mail: ahie@envirolabservices.com.au
Contact: Aileen Hie

Envirolab Services WA t/a MPL
16-18 Hayden Crt, Myaree WA 6154
Phone: 08 9317 2505 Fax :08 9317 4163
E-mail: lab@mpl.com.au
Contact: Joshua Lim

Sample information					Tests Required													Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium									Provide as much information about the sample as you can
15	G2_20230324		24/03/2023	WATER	X	X	X	X	X									
16	W3S_20230324		24/03/2023	WATER	X	X	X	X	X									
17	A7_20230324		24/03/2023	WATER	X	X	X	X	X									
18	E4_20230324		24/03/2023	WATER	X	X	X	X	X									
19	W1S_20230324		24/03/2023	WATER	X	X	X	X	X									
20	W1D_20230324		24/03/2023	WATER	X	X	X	X	X									
21	D01_20230323		24/03/2023	WATER	X	X	X	X	X									
—	T01_20230323		24/03/2023	WATER	X	X	X	X	X									Please forward to ALS
22	D02_20230324		24/03/2023	WATER	X	X	X	X	X									
23	R01_20230324		24/03/2023	WATER	X	X	X	X	X									
																		31/3/625

Relinquished by (company):	Ramboll	Received by (company):	EU EUC
Print Name:	Jake Bourke	Print Name:	CMB
Date & Time:	24/03/2023	Date & Time:	28/3 9:00
Signature:		Signature:	

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: 12 (if applicable)
Transported by: Hand delivered / courier

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

SAMPLE RECEIPT ADVICE

Client Details

Client	Ramboll Australia Pty Ltd
Attention	J Bourke, J Kirsch

Sample Login Details

Your reference	Hydro Groundwater Plume Monitoring - 318001662
Envirolab Reference	319625
Date Sample Received	28/03/2023
Date Instructions Received	28/03/2023
Date Results Expected to be Reported	04/04/2023

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	23 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	12
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

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

Sample ID	Fluoride, F	Total Cyanide	Free Cyanide in Water	HM in water - dissolved	HM in water - total
W2D_20230323	✓	✓	✓	✓	✓
W7M_20230323	✓	✓	✓	✓	✓
E5_20230323	✓	✓	✓	✓	✓
E5D_20230323	✓	✓	✓	✓	✓
F5_20230323	✓	✓	✓	✓	✓
G5_20230323	✓	✓	✓	✓	✓
F6_20230323	✓	✓	✓	✓	✓
G6_20230323	✓	✓	✓	✓	✓
N8_20230324	✓	✓	✓	✓	✓
N9_20230324	✓	✓	✓	✓	✓
W6D_20230324	✓	✓	✓	✓	✓
W11_20230324	✓	✓	✓	✓	✓
W5D_20230324	✓	✓	✓	✓	✓
N2_20230324	✓	✓	✓	✓	✓
G2_20230324	✓	✓	✓	✓	✓
W3S_20230324	✓	✓	✓	✓	✓
A7_20230324	✓	✓	✓	✓	✓
E4_20230324	✓	✓	✓	✓	✓
W1S_20230324	✓	✓	✓	✓	✓
W1D_20230324	✓	✓	✓	✓	✓
D01_20230324	✓	✓	✓	✓	✓
D02_20230324	✓	✓	✓	✓	✓
R01_20230324	✓	✓	✓	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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

CERTIFICATE OF ANALYSIS 319625

Client Details

Client	Ramboll Australia Pty Ltd
Attention	J Bourke, J Kirsch
Address	PO Box 560, North Sydney, NSW, 2060

Sample Details

Your Reference	**Hydro Groundwater Plume Monitoring - 318001662**
Number of Samples	23 Water
Date samples received	28/03/2023
Date completed instructions received	28/03/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

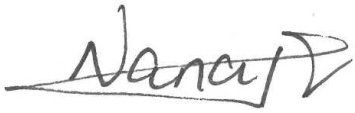
Date results requested by	04/04/2023
Date of Issue	04/04/2023

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

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

Results Approved By
Loren Bardwell, Development Chemist
Nick Sarlamis, Assistant Operation Manager

Authorised By



Nancy Zhang, Laboratory Manager

Miscellaneous Inorganics						
Our Reference		319625-1	319625-2	319625-3	319625-4	319625-5
Your Reference	UNITS	W2D_20230323	W7M_20230323	E5_20230323	E5D_20230323	F5_20230323
Date Sampled		23/03/2023	23/03/2023	23/03/2023	23/03/2023	23/03/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Date analysed	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Fluoride, F	mg/L	1,100	680	380	9.5	0.2
Total Cyanide	mg/L	230	150	97	1.1	<0.004
Free Cyanide in Water	mg/L	0.004	<0.004	0.012	<0.004	<0.004

Miscellaneous Inorganics						
Our Reference		319625-6	319625-7	319625-8	319625-9	319625-10
Your Reference	UNITS	G5_20230323	F6_20230323	G6_20230323	N8_20230324	N9_20230324
Date Sampled		23/03/2023	23/03/2023	23/03/2023	24/03/2023	24/03/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Date analysed	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Fluoride, F	mg/L	0.5	0.6	0.7	0.5	38
Total Cyanide	mg/L	0.030	<0.004	<0.004	0.53	1.1
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004

Miscellaneous Inorganics						
Our Reference		319625-11	319625-12	319625-13	319625-14	319625-15
Your Reference	UNITS	W6D_20230324	E11_20230324	W5D_20230324	N2_20230324	G2_20230324
Date Sampled		24/03/2023	24/03/2023	24/03/2023	24/03/2023	24/03/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Date analysed	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Fluoride, F	mg/L	0.1	19	0.4	2.0	0.4
Total Cyanide	mg/L	<0.004	0.53	<0.004	0.029	<0.004
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004

Miscellaneous Inorganics						
Our Reference		319625-16	319625-17	319625-18	319625-19	319625-20
Your Reference	UNITS	W3S_20230324	A7_20230324	E4_20230324	W1S_20230324	W1D_20230324
Date Sampled		24/03/2023	24/03/2023	24/03/2023	24/03/2023	24/03/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Date analysed	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Fluoride, F	mg/L	200	350	740	10	10
Total Cyanide	mg/L	30	70	200	1.4	1.4
Free Cyanide in Water	mg/L	0.008	<0.004	0.011	<0.004	<0.004

Miscellaneous Inorganics				
Our Reference		319625-21	319625-22	319625-23
Your Reference	UNITS	D01_20230324	D02_20230324	R01_20230324
Date Sampled		24/03/2023	24/03/2023	24/03/2023
Type of sample		Water	Water	Water
Date prepared	-	29/03/2023	29/03/2023	29/03/2023
Date analysed	-	29/03/2023	29/03/2023	29/03/2023
Fluoride, F	mg/L	9.3	0.4	<0.1
Total Cyanide	mg/L	1.4	<0.004	<0.004
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004

HM in water - dissolved						
Our Reference		319625-1	319625-2	319625-3	319625-4	319625-5
Your Reference	UNITS	W2D_20230323	W7M_20230323	E5_20230323	E5D_20230323	F5_20230323
Date Sampled		23/03/2023	23/03/2023	23/03/2023	23/03/2023	23/03/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Date analysed	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Aluminium-Dissolved	µg/L	430	290	60	10	2,000

HM in water - dissolved						
Our Reference		319625-6	319625-7	319625-8	319625-9	319625-10
Your Reference	UNITS	G5_20230323	F6_20230323	G6_20230323	N8_20230324	N9_20230324
Date Sampled		23/03/2023	23/03/2023	23/03/2023	24/03/2023	24/03/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Date analysed	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Aluminium-Dissolved	µg/L	300	<10	14,000	40	70

HM in water - dissolved						
Our Reference		319625-11	319625-12	319625-13	319625-14	319625-15
Your Reference	UNITS	W6D_20230324	E11_20230324	W5D_20230324	N2_20230324	G2_20230324
Date Sampled		24/03/2023	24/03/2023	24/03/2023	24/03/2023	24/03/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Date analysed	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Aluminium-Dissolved	µg/L	30	210	<10	1,800	<10

HM in water - dissolved						
Our Reference		319625-16	319625-17	319625-18	319625-19	319625-20
Your Reference	UNITS	W3S_20230324	A7_20230324	E4_20230324	W1S_20230324	W1D_20230324
Date Sampled		24/03/2023	24/03/2023	24/03/2023	24/03/2023	24/03/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Date analysed	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Aluminium-Dissolved	µg/L	300	120	230	50	50

HM in water - dissolved				
Our Reference		319625-21	319625-22	319625-23
Your Reference	UNITS	D01_20230324	D02_20230324	R01_20230324
Date Sampled		24/03/2023	24/03/2023	24/03/2023
Type of sample		Water	Water	Water
Date prepared	-	29/03/2023	29/03/2023	29/03/2023
Date analysed	-	29/03/2023	29/03/2023	29/03/2023
Aluminium-Dissolved	µg/L	<10	<10	<10

HM in water - total						
Our Reference		319625-1	319625-2	319625-3	319625-4	319625-5
Your Reference	UNITS	W2D_20230323	W7M_20230323	E5_20230323	E5D_20230323	F5_20230323
Date Sampled		23/03/2023	23/03/2023	23/03/2023	23/03/2023	23/03/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Date analysed	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Aluminium-Total	µg/L	480	8,300	240	1,900	2,100

HM in water - total						
Our Reference		319625-6	319625-7	319625-8	319625-9	319625-10
Your Reference	UNITS	G5_20230323	F6_20230323	G6_20230323	N8_20230324	N9_20230324
Date Sampled		23/03/2023	23/03/2023	23/03/2023	24/03/2023	24/03/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Date analysed	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Aluminium-Total	µg/L	470	80	14,000	910	2,700

HM in water - total						
Our Reference		319625-11	319625-12	319625-13	319625-14	319625-15
Your Reference	UNITS	W6D_20230324	E11_20230324	W5D_20230324	N2_20230324	G2_20230324
Date Sampled		24/03/2023	24/03/2023	24/03/2023	24/03/2023	24/03/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Date analysed	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Aluminium-Total	µg/L	1,400	1,100	160	8,000	130

HM in water - total						
Our Reference		319625-16	319625-17	319625-18	319625-19	319625-20
Your Reference	UNITS	W3S_20230324	A7_20230324	E4_20230324	W1S_20230324	W1D_20230324
Date Sampled		24/03/2023	24/03/2023	24/03/2023	24/03/2023	24/03/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Date analysed	-	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023
Aluminium-Total	µg/L	2,200	240	260	580	340

HM in water - total				
Our Reference		319625-21	319625-22	319625-23
Your Reference	UNITS	D01_20230324	D02_20230324	R01_20230324
Date Sampled		24/03/2023	24/03/2023	24/03/2023
Type of sample		Water	Water	Water
Date prepared	-	29/03/2023	29/03/2023	29/03/2023
Date analysed	-	29/03/2023	29/03/2023	29/03/2023
Aluminium-Total	µg/L	2,300	110	<10

Method ID	Methodology Summary
Inorg-014	Cyanide - free, total, weak acid dissociable by segmented flow analyser (in line dialysis with colourimetric finish). Solids/Filters and sorbents are extracted in a caustic media prior to analysis. Impingers are pH adjusted as required prior to analysis. Cyanides amenable to Chlorination - samples are analysed untreated and treated with hypochlorite to assess the potential for chlorination of cyanide forms. Based on APHA latest edition, 4500-CN_G,H.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Metals-022	Determination of various metals by ICP-MS.

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	319625-2
Date prepared	-			29/03/2023	1	29/03/2023	29/03/2023		29/03/2023	29/03/2023
Date analysed	-			29/03/2023	1	29/03/2023	29/03/2023		29/03/2023	29/03/2023
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	1	1100	1000	10	97	#
Total Cyanide	mg/L	0.004	Inorg-014	<0.004	1	230	[NT]		98	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	<0.004	1	0.004	[NT]		99	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	319625-8
Date prepared	-			[NT]	7	29/03/2023	29/03/2023		29/03/2023	29/03/2023
Date analysed	-			[NT]	7	29/03/2023	29/03/2023		29/03/2023	29/03/2023
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	7	0.6	[NT]		107	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	7	<0.004	<0.004	0	117	82
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	7	<0.004	<0.004	0	95	71

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	319625-22
Date prepared	-			[NT]	11	29/03/2023	29/03/2023		[NT]	29/03/2023
Date analysed	-			[NT]	11	29/03/2023	29/03/2023		[NT]	29/03/2023
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	11	0.1	0.1	0	[NT]	103
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	11	<0.004	[NT]		[NT]	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	11	<0.004	[NT]		[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	319625-23
Date prepared	-			[NT]	13	29/03/2023	29/03/2023		[NT]	29/03/2023
Date analysed	-			[NT]	13	29/03/2023	29/03/2023		[NT]	29/03/2023
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	13	0.4	[NT]		[NT]	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	13	<0.004	<0.004	0	[NT]	91
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	13	<0.004	<0.004	0	[NT]	89

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	29/03/2023	29/03/2023		[NT]	[NT]
Date analysed	-			[NT]	21	29/03/2023	29/03/2023		[NT]	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	21	9.3	9.3	0	[NT]	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	21	1.4	[NT]		[NT]	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	21	<0.004	[NT]		[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	22	29/03/2023	29/03/2023		[NT]	[NT]
Date analysed	-			[NT]	22	29/03/2023	29/03/2023		[NT]	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	22	0.4	[NT]		[NT]	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	22	<0.004	<0.004	0	[NT]	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	22	<0.004	<0.004	0	[NT]	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W5	319625-2
Date prepared	-			29/03/2023	1	29/03/2023	29/03/2023		29/03/2023	29/03/2023
Date analysed	-			29/03/2023	1	29/03/2023	29/03/2023		29/03/2023	29/03/2023
Aluminium-Dissolved	µg/L	10	Metals-022	<10	1	430	430	0	86	#

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W6	319625-22
Date prepared	-			[NT]	11	29/03/2023	29/03/2023		29/03/2023	29/03/2023
Date analysed	-			[NT]	11	29/03/2023	29/03/2023		29/03/2023	29/03/2023
Aluminium-Dissolved	µg/L	10	Metals-022	[NT]	11	30	30	0	86	80

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	29/03/2023	29/03/2023		[NT]	[NT]
Date analysed	-			[NT]	21	29/03/2023	29/03/2023		[NT]	[NT]
Aluminium-Dissolved	µg/L	10	Metals-022	[NT]	21	<10	<10	0	[NT]	[NT]

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	319625-2
Date prepared	-			29/03/2023	1	29/03/2023	29/03/2023		29/03/2023	29/03/2023
Date analysed	-			29/03/2023	1	29/03/2023	29/03/2023		29/03/2023	29/03/2023
Aluminium-Total	µg/L	10	Metals-022	<10	1	480	490	2	93	#

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	319625-22
Date prepared	-			[NT]	11	29/03/2023	29/03/2023		29/03/2023	29/03/2023
Date analysed	-			[NT]	11	29/03/2023	29/03/2023		29/03/2023	29/03/2023
Aluminium-Total	µg/L	10	Metals-022	[NT]	11	1400	1300	7	94	73

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	29/03/2023	29/03/2023		[NT]	[NT]
Date analysed	-			[NT]	21	29/03/2023	29/03/2023		[NT]	[NT]
Aluminium-Total	µg/L	10	Metals-022	[NT]	21	2300	2600	12	[NT]	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Report Comments

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

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

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

ENVIROLAB GROUP

Client: Ramboll	Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001662
Contact person: Jake Bourke	PO No.:
Project Mgr: Jordyn Kirsch	Envirolab Quote No. :
Sampler: Jake Bourke	Date results required:
Address: Level 2 Suite 18, 50 Glebe Road, The Junction	Or choose: standard / same day / 1 day / 2 day / 3 day
Phone: (02) 49625444 Mob: 0467580473	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*
Fax:	Lab comments: Highly contaminated
Email: jkirsch@ramboll.com; jbourke@ramboll.com	

Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Phone: 02 9910 6200 Fax :02 9910 6201
E-mail: ahie@envirolabservices.com.au
Contact: Aileen Hie

Envirolab Services WA t/a MPL
16-18 Hayden Crt, Myaree WA 6154
Phone: 08 9317 2505 Fax :08 9317 4163
E-mail: lab@mpl.com.au
Contact: Joshua Lim

Sample information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium										Provide as much information about the sample as you can
15	G2_20230324		24/03/2023	WATER	X	X	X	X	X										
16	W3S_20230324		24/03/2023	WATER	X	X	X	X	X										
17	A7_20230324		24/03/2023	WATER	X	X	X	X	X										
18	E4_20230324		24/03/2023	WATER	X	X	X	X	X										
19	W1S_20230324		24/03/2023	WATER	X	X	X	X	X										
20	W1D_20230324		24/03/2023	WATER	X	X	X	X	X										
21	D01_20230323		24/03/2023	WATER	X	X	X	X	X										
—	T01_20230323		24/03/2023	WATER	X	X	X	X	X										Please forward to ALS
22	D02_20230324		24/03/2023	WATER	X	X	X	X	X										
23	R01_20230324		24/03/2023	WATER	X	X	X	X	X										

Environmental Division
Sydney
Work Order Reference
ES2310253

Telephone : +61-2-8784 8555

Relinquished by (company):	Ramboll	Received by (company):	EA QUO
Print Name:	Jake Bourke	Print Name:	
Date & Time:	24/03/2023	Date & Time:	28/3 1400
Signature:		Signature:	

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: 12 (if applicable)
Transported by: Hand delivered / courier

Relinquished by: D.White 28/3/23 1400

Rec: Jack 28/03/23 1635

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2310253**

Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Contact	: Customer Services ES
Address	: PO BOX 435 THE JUNCTION 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: jkirsch@ramboll.com	E-mail	: ALSEnviro.Sydney@ALSGlobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: Hydro Groundwater Plume Monitoring - 318001662	Page	: 1 of 2
Order number	: ----	Quote number	: EB2017ENVIAUS0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: JAKE BOURKE		

Dates

Date Samples Received	: 28-Mar-2023 16:34	Issue Date	: 28-Mar-2023
Client Requested Due Date	: 04-Apr-2023	Scheduled Reporting Date	: **04-Apr-2023**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 13'C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

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 ± 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 - EG020F Dissolved Metals by ICP/MS	WATER - EG020T Total Metals by ICP/MS (including digestion)	WATER - EK025SF Free CN By Segmented Flow Analyser	WATER - EK026SF Total Cyanide by Segmented Flow Analyser	WATER - EK040-P Fluoride (Auto Titrator)
ES2310253-001	24-Mar-2023 00:00	T01_20230323	✓	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE		
- A4 - AU Tax Invoice (INV)	Email	AsiaPac-Accounts@Ramboll.com
JAKE BOURKE		
- *AU Certificate of Analysis - NATA (COA)	Email	JBOURKE@ramboll.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	JBOURKE@ramboll.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	JBOURKE@ramboll.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	JBOURKE@ramboll.com
- A4 - AU Tax Invoice (INV)	Email	JBOURKE@ramboll.com
- Chain of Custody (CoC) (COC)	Email	JBOURKE@ramboll.com
- EDI Format - SRAENV (SRAENV)	Email	JBOURKE@ramboll.com
- EDI Format - XTab (XTAB)	Email	JBOURKE@ramboll.com
JORDYN KIRSCH		
- *AU Certificate of Analysis - NATA (COA)	Email	jkirsch@ramboll.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jkirsch@ramboll.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jkirsch@ramboll.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jkirsch@ramboll.com
- A4 - AU Tax Invoice (INV)	Email	jkirsch@ramboll.com
- Chain of Custody (CoC) (COC)	Email	jkirsch@ramboll.com
- EDI Format - SRAENV (SRAENV)	Email	jkirsch@ramboll.com
- EDI Format - XTab (XTAB)	Email	jkirsch@ramboll.com

CERTIFICATE OF ANALYSIS

Work Order	: **ES2310253**	Page	: 1 of 2
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Contact	: Customer Services ES
Address	: PO BOX 435 THE JUNCTION 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: Hydro Groundwater Plume Monitoring - 318001662	Date Samples Received	: 28-Mar-2023 16:34
Order number	: ----	Date Analysis Commenced	: 29-Mar-2023
C-O-C number	: ----	Issue Date	: 03-Apr-2023 12:15
Sampler	: JAKE BOURKE		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

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.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	T01_20230323	----	----	----	----
				Sampling date / time	23-Mar-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2310253-001	--------	--------	--------	--------
					Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	----	----	----	----
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**3.20**	----	----	----	----
EK025SF: Free CN by Segmented Flow Analyser									
Free Cyanide	----	0.004	mg/L		<0.004	----	----	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		**0.421**	----	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**8.6**	----	----	----	----

QUALITY CONTROL REPORT

Work Order	: **ES2310253**	Page	: 1 of 3
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Contact	: Customer Services ES
Address	: PO BOX 435 THE JUNCTION 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: Hydro Groundwater Plume Monitoring - 318001662	Date Samples Received	: 28-Mar-2023
Order number	: ----	Date Analysis Commenced	: 29-Mar-2023
C-O-C number	: ----	Issue Date	: 03-Apr-2023
Sampler	: JAKE BOURKE		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 1		
No. of samples analysed	: 1		

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*
Ankit Joshi	Senior Chemist - Inorganics	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**

				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: 4966838)									
ES2310370-001	Anonymous	EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.04	0.04	0.0	No Limit
ME2300621-001	Anonymous	EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.02	0.02	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 4962212)									
ES2310245-001	Anonymous	EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.69	0.83	18.2	0% - 20%
ES2310245-002	Anonymous	EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.29	0.29	0.0	0% - 20%
EK025SF: Free CN by Segmented Flow Analyser (QC Lot: 4959158)									
ES2310223-001	Anonymous	EK025SF: Free Cyanide	----	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 4959156)									
ES2310129-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 4961194)									
ES2310159-001	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.7	0.7	0.0	No Limit
ES2310376-002	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4966838)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	98.6	80.0	116
EG020T: Total Metals by ICP-MS (QCLot: 4962212)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	95.9	82.0	120
EK025SF: Free CN by Segmented Flow Analyser (QCLot: 4959158)								
EK025SF: Free Cyanide	----	0.004	mg/L	<0.004	0.2 mg/L	106	88.0	128
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4959156)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	105	73.0	133
EK040P: Fluoride by PC Titrator (QCLot: 4961194)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	94.8	82.0	116

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			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK025SF: Free CN by Segmented Flow Analyser (QCLot: 4959158)							
ES2310223-001	Anonymous	EK025SF: Free Cyanide	----	0.2 mg/L	107	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4959156)							
ES2310129-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.2 mg/L	108	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 4961194)							
ES2310159-002	Anonymous	EK040P: Fluoride	16984-48-8	5 mg/L	87.6	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2310253**	Page	: 1 of 4
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Telephone	: +61-2-8784 8555
Project	: Hydro Groundwater Plume Monitoring - 318001662	Date Samples Received	: 28-Mar-2023
Site	: ----	Issue Date	: 03-Apr-2023
Sampler	: JAKE BOURKE	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

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 / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
	0				
Matrix Spikes (MS)					
Dissolved Metals by ICP-MS - Suite A	0	4	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	0	15	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
T01_20230323	**23-Mar-2023**	**----**	----	----	**31-Mar-2023**	19-Sep-2023	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
T01_20230323	**23-Mar-2023**	**30-Mar-2023**	19-Sep-2023	✓	**30-Mar-2023**	19-Sep-2023	✓
EK025SF: Free CN by Segmented Flow Analyser							
Black Opaque Plastic Bottle - NaOH (EK025SF)							
T01_20230323	**23-Mar-2023**	**----**	----	----	**29-Mar-2023**	06-Apr-2023	✓
EK026SF: Total CN by Segmented Flow Analyser							
Black Opaque Plastic Bottle - NaOH (EK026SF)							
T01_20230323	**23-Mar-2023**	**----**	----	----	**29-Mar-2023**	06-Apr-2023	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
T01_20230323	**23-Mar-2023**	**----**	----	----	**29-Mar-2023**	20-Apr-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)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	4	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	4	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	0	4	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	0	15	**0.00**	**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
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
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.
Free CN by Segmented Flow Analyser	EK025SF	WATER	In house: Referenced to ASTM D7237, APHA 4500-CN-C&O and ISO 14403: Using an automated segmented flow analyser, a sample at high pH (sodium hydroxide preserved) is buffered to pH 6.0. The hydrogen cyanide present passes across a gas dialysis membrane into an acceptor stream consisting of 0.01 M sodium hydroxide. The acceptor stream mixes with a buffer at pH 5.2 and reacts with chloramine-T to form cyanogen chloride. Cyanogen chloride reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour, measured at 600nm. This method is compliant with NEPM Schedule B(3)
Total Cyanide by Segmented Flow Analyser	EK026SF	WATER	In house: Referenced to APHA 4500-CN C&O / ASTM D7511 / ISO 14403. Sodium hydroxide preserved samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM Schedule B(3)
Fluoride by Auto Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. 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)

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP

Client: Ramboll	Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001662	**Envirolab Services** 12 Ashley St, Chatswood, NSW 2067 Phone: 02 9910 6200 Fax :02 9910 6201 E-mail: ahie@envirolabservices.com.au Contact: Aileen Hie
Contact person: Jake Bourke		
Project Mgr: Kirsty Greenfield	PO No.:	
Sampler: Jake Bourke	Envirolab Quote No. :	
Address: Level 2 Suite 18, 50 Glebe Road,	Date results required:	
The Junction	Or choose: standard / same day / 1 day / 2 day / 3 day	**Envirolab Services WA t/a MPL** 16-18 Hayden Crt, Myaree WA 6154 Phone: 08 9317 2505 Fax :08 9317 4163 E-mail: lab@mpl.com.au Contact: Joshua Lim
Phone: (02) 49625444 Mob: 0467580473	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	
Fax:	Lab comments: Highly contaminated	
Email: jkirsch@ramboll.com; jbourke@ramboll.com		

Sample information					Tests Required												Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium										Provide as much information about the sample as you can
1	E4_20230622		22/06/2023	WATER	X	X	X	X	X										
2	W1D_20230622		22/06/2023	WATER	X	X	X	X	X										
3	W1S_20230622		22/06/2023	WATER	X	X	X	X	X										
4	A7_20230622		22/06/2023	WATER	X	X	X	X	X										
5	W3S_20230622		22/06/2023	WATER	X	X	X	X	X										
6	G2_20230622		22/06/2023	WATER	X	X	X	X	X										
7	N8_20230622		22/06/2023	WATER	X	X	X	X	X										
8	N9_20230622		22/06/2023	WATER	X	X	X	X	X										
9	W6D_20230622		22/06/2023	WATER	X	X	X	X	X										
10	E11_20230622		22/06/2023	WATER	X	X	X	X	X										
11	W5D_20230622		22/06/2023	WATER	X	X	X	X	X										
12	D01_20230622		22/06/2023	WATER	X	X	X	X	X										
13	SD T01_20230622		22/06/2023	WATER	X	X	X	X	X										Please forward to ALS
14	SD D02_20230622		22/06/2023	WATER	X	X	X	X	X										

Relinquished by (company):	Ramboll	Received by (company):	ALS SYD
Print Name:	Jake Bourke	Print Name:	Sheng
Date & Time:	23/06/2023	Date & Time:	27/6 1115
Signature:		Signature:	

Lab use only: 326522
Samples Received: Cool or Ambient (circle one)
Temperature Received at: 9 (if applicable)
Transported by: Hand delivered / courier

ENVIROLAB GROUP

Client: Ramboll	Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001662	Envirolab Services 12 Ashley St, Chatswood, NSW 2067 Phone: 02 9910 6200 Fax :02 9910 6201 E-mail: ahie@envirolabservices.com.au Contact: Aileen Hie
Contact person: Jake Bourke	PO No.:	
Project Mgr: Kirsty Greenfield	Envirolab Quote No. :	
Sampler: Jake Bourke, Matilda Englert	Date results required:	
Address: Level 2 Suite 18, 50 Glebe Road, The Junction	Or choose: standard / same day / 1 day / 2 day / 3 day	Envirolab Services WA t/a MPL 16-18 Hayden Crt, Myaree WA 6154 Phone: 08 9317 2505 Fax :08 9317 4163 E-mail: lab@mpl.com.au Contact: Joshua Lim
Phone: (02) 49625444 Mob: 0467580473	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	
Fax:	Lab comments: Highly contaminated	
Email: jkirsch@ramboll.com; jbourke@ramboll.com		

Sample information					Tests Required													Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium	HOLD								Provide as much information about the sample as you can
184	SD G5_20230623		23/06/2023	WATER	X	X	X	X	X									
185	SD G6_20230623		23/06/2023	WATER	X	X	X	X	X									
186	SD F5_20230623		23/06/2023	WATER	X	X	X	X	X									
187	SD F6_20230623		23/06/2023	WATER	X	X	X	X	X									
188	SD E5D_20230623		23/06/2023	WATER	X	X	X	X	X									
189	W7M_20230623		23/06/2023	WATER	X	X	X	X	X									
190	W2D_20230623		23/06/2023	WATER	X	X	X	X	X									
191	N2_20230623		23/06/2023	WATER	X	X	X	X	X									
192	R01_20230623		23/06/2023	WATER	X	X	X	X	X	X								
193	D01_20230623		23/06/2023	WATER						X								

Relinquished by (company):	Ramboll	Received by (company): ECS SYD	Lab use only: 326522
Print Name:	Jake Bourke	Print Name: Sherry	Samples Received: Cool or Ambient (circle one)
Date & Time:	23/06/2023	Date & Time: 27/6 1115	Temperature Received at: 8 (if applicable)
Signature:		Signature: SD	Transported by: Hand delivered / courier

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

SAMPLE RECEIPT ADVICE

Client Details

Client	Ramboll Australia Pty Ltd
Attention	J Bourke, J Kirsch

Sample Login Details

Your reference	Hydro Groundwater Plume Monitoring - 318001662
Envirolab Reference	326522
Date Sample Received	27/06/2023
Date Instructions Received	27/06/2023
Date Results Expected to be Reported	04/07/2023

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	23 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	8
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

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

Sample ID	Fluoride, F	Total Cyanide	Free Cyanide in Water	HM in water - dissolved	HM in water - total	On Hold
E4_20230622	✓	✓	✓	✓	✓	
W1D_20230622	✓	✓	✓	✓	✓	
W1S_20230622	✓	✓	✓	✓	✓	
A7_20230622	✓	✓	✓	✓	✓	
W3S_20230622	✓	✓	✓	✓	✓	
G2_20230622	✓	✓	✓	✓	✓	
N8_20230622	✓	✓	✓	✓	✓	
N9_20230622	✓	✓	✓	✓	✓	
W6D_20230622	✓	✓	✓	✓	✓	
E11_20230622	✓	✓	✓	✓	✓	
W5D_20230622	✓	✓	✓	✓	✓	
D01_20230622	✓	✓	✓	✓	✓	
D02_20230622	✓	✓	✓	✓	✓	
G5_20230623	✓	✓	✓	✓	✓	
G6_20230623	✓	✓	✓	✓	✓	
F5_20230623	✓	✓	✓	✓	✓	
F6_20230623	✓	✓	✓	✓	✓	
E5D_20230623	✓	✓	✓	✓	✓	
W7M_20230623	✓	✓	✓	✓	✓	
W2D_20230623	✓	✓	✓	✓	✓	
N2_20230623	✓	✓	✓	✓	✓	
R01_20230623	✓	✓	✓	✓	✓	
D01_20230623						✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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

CERTIFICATE OF ANALYSIS 326522

Client Details

Client	Ramboll Australia Pty Ltd
Attention	J Bourke, J Kirsch
Address	PO Box 560, North Sydney, NSW, 2060

Sample Details

Your Reference	**Hydro Groundwater Plume Monitoring - 318001662**
Number of Samples	23 Water
Date samples received	27/06/2023
Date completed instructions received	27/06/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	04/07/2023
Date of Issue	04/07/2023

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Results Approved By
Jenny He, Senior Chemist
Loren Bardwell, Development Chemist

Authorised By
Nancy Zhang, Laboratory Manager

Miscellaneous Inorganics						
Our Reference		326522-1	326522-2	326522-3	326522-4	326522-5
Your Reference	UNITS	E4_20230622	W1D_20230622	W1S_20230622	A7_20230622	W3S_20230622
Date Sampled		22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Date analysed	-	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Fluoride, F	mg/L	600	8.8	8.8	300	130
Total Cyanide	mg/L	210	1.4	1.1	78	33
Free Cyanide in Water	mg/L	0.068	<0.004	<0.004	0.005	0.005

Miscellaneous Inorganics						
Our Reference		326522-6	326522-7	326522-8	326522-9	326522-10
Your Reference	UNITS	G2_20230622	N8_20230622	N9_20230622	W6D_20230622	E11_20230622
Date Sampled		22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Date analysed	-	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Fluoride, F	mg/L	0.3	0.6	48	<0.1	27
Total Cyanide	mg/L	<0.004	0.71	1.7	<0.004	0.47
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004

Miscellaneous Inorganics						
Our Reference		326522-11	326522-12	326522-13	326522-14	326522-15
Your Reference	UNITS	W5D_20230622	D01_20230622	D02_20230622	G5_20230623	G6_20230623
Date Sampled		22/06/2023	22/06/2023	22/06/2023	23/06/2023	23/06/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Date analysed	-	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Fluoride, F	mg/L	0.4	8.6	0.3	0.1	0.6
Total Cyanide	mg/L	<0.004	1.4	<0.004	<0.004	<0.004
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004

Miscellaneous Inorganics						
Our Reference		326522-16	326522-17	326522-18	326522-19	326522-20
Your Reference	UNITS	F5_20230623	F6_20230623	E5D_20230623	W7M_20230623	W2D_20230623
Date Sampled		23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Date analysed	-	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Fluoride, F	mg/L	0.2	0.5	8.7	560	930
Total Cyanide	mg/L	<0.004	<0.004	1.2	150	280
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	0.060	0.12

Miscellaneous Inorganics			
Our Reference		326522-21	326522-22
Your Reference	UNITS	N2_20230623	R01_20230623
Date Sampled		23/06/2023	23/06/2023
Type of sample		Water	Water
Date prepared	-	28/06/2023	28/06/2023
Date analysed	-	28/06/2023	28/06/2023
Fluoride, F	mg/L	1.4	<0.1
Total Cyanide	mg/L	0.017	<0.004
Free Cyanide in Water	mg/L	<0.004	<0.004

HM in water - dissolved						
Our Reference		326522-1	326522-2	326522-3	326522-4	326522-5
Your Reference	UNITS	E4_20230622	W1D_20230622	W1S_20230622	A7_20230622	W3S_20230622
Date Sampled		22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	30/06/2023	30/06/2023	30/06/2023	30/06/2023	30/06/2023
Date analysed	-	01/07/2023	01/07/2023	01/07/2023	01/07/2023	01/07/2023
Aluminium-Dissolved	µg/L	320	130	70	180	260

HM in water - dissolved						
Our Reference		326522-6	326522-7	326522-8	326522-9	326522-10
Your Reference	UNITS	G2_20230622	N8_20230622	N9_20230622	W6D_20230622	E11_20230622
Date Sampled		22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	30/06/2023	30/06/2023	30/06/2023	30/06/2023	30/06/2023
Date analysed	-	01/07/2023	01/07/2023	01/07/2023	01/07/2023	01/07/2023
Aluminium-Dissolved	µg/L	<10	50	70	30	180

HM in water - dissolved						
Our Reference		326522-11	326522-12	326522-13	326522-14	326522-15
Your Reference	UNITS	W5D_20230622	D01_20230622	D02_20230622	G5_20230623	G6_20230623
Date Sampled		22/06/2023	22/06/2023	22/06/2023	23/06/2023	23/06/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	30/06/2023	30/06/2023	30/06/2023	30/06/2023	30/06/2023
Date analysed	-	01/07/2023	01/07/2023	01/07/2023	01/07/2023	01/07/2023
Aluminium-Dissolved	µg/L	<10	260	<10	20	18,000

HM in water - dissolved						
Our Reference		326522-16	326522-17	326522-18	326522-19	326522-20
Your Reference	UNITS	F5_20230623	F6_20230623	E5D_20230623	W7M_20230623	W2D_20230623
Date Sampled		23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	30/06/2023	30/06/2023	30/06/2023	30/06/2023	30/06/2023
Date analysed	-	01/07/2023	01/07/2023	01/07/2023	01/07/2023	01/07/2023
Aluminium-Dissolved	µg/L	3,100	70	<10	200	740

HM in water - dissolved			
Our Reference		326522-21	326522-22
Your Reference	UNITS	N2_20230623	R01_20230623
Date Sampled		23/06/2023	23/06/2023
Type of sample		Water	Water
Date prepared	-	30/06/2023	30/06/2023
Date analysed	-	01/07/2023	01/07/2023
Aluminium-Dissolved	µg/L	4,600	<10

HM in water - total						
Our Reference		326522-1	326522-2	326522-3	326522-4	326522-5
Your Reference	UNITS	E4_20230622	W1D_20230622	W1S_20230622	A7_20230622	W3S_20230622
Date Sampled		22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/06/2023	29/06/2023	03/07/2023	29/06/2023	29/06/2023
Date analysed	-	29/06/2023	29/06/2023	04/07/2023	29/06/2023	29/06/2023
Aluminium-Total	µg/L	550	420	75,000	210	1,200

HM in water - total						
Our Reference		326522-6	326522-7	326522-8	326522-9	326522-10
Your Reference	UNITS	G2_20230622	N8_20230622	N9_20230622	W6D_20230622	E11_20230622
Date Sampled		22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023
Date analysed	-	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023
Aluminium-Total	µg/L	140	4,400	6,400	3,000	2,200

HM in water - total						
Our Reference		326522-11	326522-12	326522-13	326522-14	326522-15
Your Reference	UNITS	W5D_20230622	D01_20230622	D02_20230622	G5_20230623	G6_20230623
Date Sampled		22/06/2023	22/06/2023	22/06/2023	23/06/2023	23/06/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/06/2023	29/06/2023	29/06/2023	29/06/2023	03/07/2023
Date analysed	-	29/06/2023	29/06/2023	29/06/2023	29/06/2023	04/07/2023
Aluminium-Total	µg/L	890	450	170	190	19,000

HM in water - total						
Our Reference		326522-16	326522-17	326522-18	326522-19	326522-20
Your Reference	UNITS	F5_20230623	F6_20230623	E5D_20230623	W7M_20230623	W2D_20230623
Date Sampled		23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023
Date analysed	-	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023
Aluminium-Total	µg/L	3,200	160	510	9,900	1,300

HM in water - total			
Our Reference		326522-21	326522-22
Your Reference	UNITS	N2_20230623	R01_20230623
Date Sampled		23/06/2023	23/06/2023
Type of sample		Water	Water
Date prepared	-	29/06/2023	29/06/2023
Date analysed	-	29/06/2023	29/06/2023
Aluminium-Total	µg/L	3,900	<10

Method ID	Methodology Summary
Inorg-014	Cyanide - free, total, weak acid dissociable by segmented flow analyser (in line dialysis with colourimetric finish). Solids/Filters and sorbents are extracted in a caustic media prior to analysis. Impingers are pH adjusted as required prior to analysis. Cyanides amenable to Chlorination - samples are analysed untreated and treated with hypochlorite to assess the potential for chlorination of cyanide forms. Based on APHA latest edition, 4500-CN_G,H.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements.

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	326522-2
Date prepared	-			28/06/2023	1	28/06/2023	28/06/2023		28/06/2023	28/06/2023
Date analysed	-			28/06/2023	1	28/06/2023	28/06/2023		28/06/2023	28/06/2023
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	1	600	600	0	99	##
Total Cyanide	mg/L	0.004	Inorg-014	<0.004	1	210	[NT]		112	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	<0.004	1	0.068	[NT]		90	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	326522-9
Date prepared	-			[NT]	4	28/06/2023	28/06/2023		28/06/2023	28/06/2023
Date analysed	-			[NT]	4	28/06/2023	28/06/2023		28/06/2023	28/06/2023
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	4	300	300	0	90	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	4	78	[NT]		116	76
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	4	0.005	[NT]		95	#

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	326522-11
Date prepared	-			[NT]	8	28/06/2023	28/06/2023		[NT]	28/06/2023
Date analysed	-			[NT]	8	28/06/2023	28/06/2023		[NT]	28/06/2023
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	8	48	[NT]		[NT]	87
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	8	1.7	1.7	0	[NT]	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	8	<0.004	<0.004	0	[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	326522-22
Date prepared	-			[NT]	11	28/06/2023	28/06/2023		[NT]	28/06/2023
Date analysed	-			[NT]	11	28/06/2023	28/06/2023		[NT]	28/06/2023
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	11	0.4	[NT]		[NT]	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	11	<0.004	<0.004	0	[NT]	105
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	11	<0.004	<0.004	0	[NT]	88

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	28/06/2023	28/06/2023		[NT]	[NT]
Date analysed	-			[NT]	21	28/06/2023	28/06/2023		[NT]	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	21	1.4	1.3	7	[NT]	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	21	0.017	0.017	0	[NT]	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	21	<0.004	<0.004	0	[NT]	[NT]

QUALITY CONTROL: HM in water - dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	326522-2
Date prepared	-			30/06/2023	1	30/06/2023	30/06/2023		30/06/2023	30/06/2023
Date analysed	-			01/07/2023	1	01/07/2023	01/07/2023		01/07/2023	01/07/2023
Aluminium-Dissolved	µg/L	10	Metals-022	<10	1	320	320	0	95	79

QUALITY CONTROL: HM in water - dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date prepared	-			[NT]	11	30/06/2023	30/06/2023		30/06/2023	[NT]
Date analysed	-			[NT]	11	01/07/2023	01/07/2023		01/07/2023	[NT]
Aluminium-Dissolved	µg/L	10	Metals-022	[NT]	11	<10	<10	0	93	[NT]

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	326522-2
Date prepared	-			29/06/2023	1	29/06/2023	29/06/2023		29/06/2023	29/06/2023
Date analysed	-			29/06/2023	1	29/06/2023	29/06/2023		29/06/2023	29/06/2023
Aluminium-Total	µg/L	10	Metals-022	<10	1	550	540	2	91	#

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W5	[NT]
Date prepared	-			[NT]	12	29/06/2023	29/06/2023		29/06/2023	[NT]
Date analysed	-			[NT]	12	29/06/2023	29/06/2023		29/06/2023	[NT]
Aluminium-Total	µg/L	10	Metals-022	[NT]	12	450	510	12	92	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Report Comments

MISC_INORG:# Low spike recovery was obtained for this sample. The sample was re-analysed and re-spiked and the low recovery was confirmed. This is due to matrix interferences. However, an acceptable recovery was obtained for the LCS.

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

Dissolved Metals: no filtered, preserved sample was received for #16, 18, 20 and 21, therefore the unpreserved sample was filtered through 0.45µm filter at the lab.
Note: there is a possibility some elements may be underestimated.

MISC_INORG: ## Percent recovery is not applicable due to the high concentration of the analyte/s in the sample/s. However an acceptable recovery was obtained for the LCS.

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP

ENVIROLAB GROUP

Client: Ramboll	**Client Project Name / Number / Site etc (ie report title):** Hydro Groundwater Plume Monitoring - 318001662	**Envirolab Services** 12 Ashley St, Chatswood, NSW 2067 Phone: 02 9910 6200 Fax :02 9910 6201 E-mail: ahie@envirolabservices.com.au Contact: Aileen Hie
Contact person: Jake Bourke	**PO No.:**	
Project Mgr: Kirsty Greenfield	**Envirolab Quote No. :**	
Sampler: Jake Bourke	**Date results required:**	
Address: Level 2 Suite 18, 50 Glebe Road, The Junction	**Or choose:** standard / same day / 1 day / 2 day / 3 day *Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	**Envirolab Services WA t/a MPL** 16-18 Hayden Crt, Myaree WA 6154 Phone: 08 9317 2505 Fax :08 9317 4163 E-mail: lab@mpl.com.au Contact: Joshua Lim
Phone: (02) 49625444 **Mob:** 0467580473	**Lab comments:** Highly contaminated	
Fax:		
Email: jkirsch@ramboll.com; jbourke@ramboll.com		

Sample information					Tests Required						Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium		Provide as much information about the sample as you can
1	E4_20230622		22/06/2023	WATER	X	X	X	X	X		
2	W1D_20230622		22/06/2023	WATER	X	X	X	X	X		
3	W1S_20230622		22/06/2023	WATER	X	X	X	X	X		
4	A7_20230622		22/06/2023	WATER	X	X	X	X	X		
5	W3S_20230622		22/06/2023	WATER	X	X	X	X	X		
6	G2_20230622		22/06/2023	WATER	X	X	X	X	X		
7	N8_20230622		22/06/2023	WATER	X	X	X	X	X		
8	N9_20230622		22/06/2023	WATER	X	X	X	X	X		
9	W6D_20230622		22/06/2023	WATER	X	X	X	X	X		
10	E11_20230622		22/06/2023	WATER	X	X	X	X	X		
11	W5D_20230622		22/06/2023	WATER	X	X	X	X	X		
12	D01_20230622		22/06/2023	WATER	X	X	X	X	X		
13	SD T01_20230622		22/06/2023	WATER	X	X	X	X	X		Please forward to ALS
14	SD D02_20230622		22/06/2023	WATER	X	X	X	X	X		

Environmental Division Sydney
Work Order Reference
ES2321517

Telephone : +61-2-8784 8555

Relinquished by (company):	Ramboll	**Received by (company):**	ELS SYD
Print Name:	Jake Bourke	**Print Name:**	Sherry
Date & Time:	23/06/2023	**Date & Time:**	27/6 1115
Signature:		**Signature:**	SD

ELS SYD
Dg Hyun Lee
28/6/23 @ 11:40
DHL

Lab use only: 326522
Samples Received: Cool or Ambient (circle one)
Temperature Received at: 4 (if applicable)
Transported by: Hand delivered / courier

rec: FAX 28/6/23 3:45

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2321517**

Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR JAKE BOURKE	Contact	: Customer Services ES
Address	: EASTPOINT COMPLEX SUITE 19B, LEVEL 2 50 GLEBE ROAD THE JUNCTION NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: JBOURKE@ramboll.com	E-mail	: ALSEnviro.Sydney@ALSGlobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: Hydro Groundwater Plume Monitoring - 318001662	Page	: 1 of 2
Order number	: ----	Quote number	: EB2017ENVIAUS0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: JAKE BOURKE		

Dates

Date Samples Received	: 28-Jun-2023 15:20	Issue Date	: 29-Jun-2023
Client Requested Due Date	: 04-Jul-2023	Scheduled Reporting Date	: **04-Jul-2023**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 10.1'C - Ice Bricks present
Receipt Detail	: hard esky	No. of samples received / analysed	: 1 / 1

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 ± 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 - EG020A-F Dissolved Metals by ICPMS - Suite A	WATER - EG020A-T Total Metals by ICPMS - Suite A	WATER - EK025SF Free CN By Segmented Flow Analyser	WATER - EK026SF Total Cyanide by Segmented Flow Analyser	WATER - EK040-P Fluoride (Auto Titrator)
ES2321517-001	22-Jun-2023 00:00	T01_20230622	✓	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	AsiaPac-Accounts@Ramboll.com

JAKE BOURKE

- *AU Certificate of Analysis - NATA (COA)	Email	JBOURKE@ramboll.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	JBOURKE@ramboll.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	JBOURKE@ramboll.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	JBOURKE@ramboll.com
- Chain of Custody (CoC) (COC)	Email	JBOURKE@ramboll.com
- EDI Format - EQUIS_ENVIRON (EQUIS_ENVIRON)	Email	JBOURKE@ramboll.com
- EDI Format - XTab (XTAB)	Email	JBOURKE@ramboll.com

JORDYN KIRSCH

- *AU Certificate of Analysis - NATA (COA)	Email	jkirsch@ramboll.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jkirsch@ramboll.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jkirsch@ramboll.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jkirsch@ramboll.com
- Chain of Custody (CoC) (COC)	Email	jkirsch@ramboll.com
- EDI Format - EQUIS_ENVIRON (EQUIS_ENVIRON)	Email	jkirsch@ramboll.com
- EDI Format - XTab (XTAB)	Email	jkirsch@ramboll.com

CERTIFICATE OF ANALYSIS

Work Order	: **ES2321517**	Page	: 1 of 2
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR JAKE BOURKE	Contact	: Customer Services ES
Address	: EASTPOINT COMPLEX SUITE 19B, LEVEL 2 50 GLEBE ROAD THE JUNCTION NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: Hydro Groundwater Plume Monitoring - 318001662	Date Samples Received	: 28-Jun-2023 15:20
Order number	: ----	Date Analysis Commenced	: 30-Jun-2023
C-O-C number	: ----	Issue Date	: 04-Jul-2023 18:11
Sampler	: JAKE BOURKE		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

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.

- EK025: LOR raised for CN sample 1 due to sample matrix.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**T01_20230622**	----	----	----	----
			Sampling date / time	22-Jun-2023 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2321517-001**	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.10**	**----**	**----**	**----**	**----**
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.16**	**----**	**----**	**----**	**----**
EK025SF: Free CN by Segmented Flow Analyser								
Free Cyanide	----	0.004	mg/L	<0.020	**----**	**----**	**----**	**----**
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	**0.980**	**----**	**----**	**----**	**----**
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**8.5**	**----**	**----**	**----**	**----**

QUALITY CONTROL REPORT

Work Order	: **ES2321517**	Page	: 1 of 3
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR JAKE BOURKE	Contact	: Customer Services ES
Address	: EASTPOINT COMPLEX SUITE 19B, LEVEL 2 50 GLEBE ROAD THE JUNCTION NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: Hydro Groundwater Plume Monitoring - 318001662	Date Samples Received	: 28-Jun-2023
Order number	: ----	Date Analysis Commenced	: 30-Jun-2023
C-O-C number	: ----	Issue Date	: 04-Jul-2023
Sampler	: JAKE BOURKE		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 1		
No. of samples analysed	: 1		

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*
Ankit Joshi	Senior Chemist - Inorganics	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**

				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: 5143924)									
ES2321504-023	Anonymous	EG020A-F: Aluminium	7429-90-5	0.01	mg/L	40 µg/L	0.01	111	No Limit
ES2321504-014	Anonymous	EG020A-F: Aluminium	7429-90-5	0.01	mg/L	180 µg/L	0.19	0.0	0% - 50%
EG020T: Total Metals by ICP-MS (QC Lot: 5143956)									
ES2321439-007	Anonymous	EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.56	0.52	8.5	0% - 20%
WN2307980-008	Anonymous	EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK025SF: Free CN by Segmented Flow Analyser (QC Lot: 5143866)									
ES2321517-001	T01_20230622	EK025SF: Free Cyanide	----	0.004	mg/L	<0.020	<0.020	0.0	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 5143865)									
WN2308044-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
ES2321517-001	T01_20230622	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	0.980	0.985	0.5	0% - 20%
EK040P: Fluoride by PC Titrator (QC Lot: 5143677)									
ES2320269-001	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.3	0.2	0.0	No Limit
ES2321304-001	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.7	0.6	16.7	No Limit

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 5143924)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	82.9	80.0	116
EG020T: Total Metals by ICP-MS (QCLot: 5143956)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	92.2	82.0	120
EK025SF: Free CN by Segmented Flow Analyser (QCLot: 5143866)								
EK025SF: Free Cyanide	----	0.004	mg/L	<0.004	0.2 mg/L	101	88.0	128
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 5143865)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	103	73.0	133
EK040P: Fluoride by PC Titrator (QCLot: 5143677)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	94.5	82.0	116

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			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK025SF: Free CN by Segmented Flow Analyser (QCLot: 5143866)							
ES2321517-001	T01_20230622	EK025SF: Free Cyanide	----	2 mg/L	94.6	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 5143865)							
ES2321517-001	T01_20230622	EK026SF: Total Cyanide	57-12-5	2 mg/L	96.1	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 5143677)							
ES2320269-002	Anonymous	EK040P: Fluoride	16984-48-8	5 mg/L	87.6	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2321517**	Page	: 1 of 4
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR JAKE BOURKE	Telephone	: +61-2-8784 8555
Project	: Hydro Groundwater Plume Monitoring - 318001662	Date Samples Received	: 28-Jun-2023
Site	: ----	Issue Date	: 04-Jul-2023
Sampler	: JAKE BOURKE	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

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 / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
	0				
Matrix Spikes (MS)					
Dissolved Metals by ICP-MS - Suite A	0	20	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	0	1	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
T01_20230622	**22-Jun-2023**	**----**	----	**----**	**30-Jun-2023**	19-Dec-2023	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
T01_20230622	**22-Jun-2023**	**30-Jun-2023**	19-Dec-2023	✓	**30-Jun-2023**	19-Dec-2023	✓
EK025SF: Free CN by Segmented Flow Analyser							
Opaque plastic bottle - NaOH (EK025SF)							
T01_20230622	**22-Jun-2023**	**----**	----	**----**	**30-Jun-2023**	06-Jul-2023	✓
EK026SF: Total CN by Segmented Flow Analyser							
Opaque plastic bottle - NaOH (EK026SF)							
T01_20230622	**22-Jun-2023**	**----**	----	**----**	**30-Jun-2023**	06-Jul-2023	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
T01_20230622	**22-Jun-2023**	**----**	----	**----**	**30-Jun-2023**	20-Jul-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)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	1	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	1	**200.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	0	20	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	0	1	**0.00**	**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
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
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.
Free CN by Segmented Flow Analyser	EK025SF	WATER	In house: Referenced to ASTM D7237, APHA 4500-CN-C&O and ISO 14403: Using an automated segmented flow analyser, a sample at high pH (sodium hydroxide preserved) is buffered to pH 6.0. The hydrogen cyanide present passes across a gas dialysis membrane into an acceptor stream consisting of 0.01 M sodium hydroxide. The acceptor stream mixes with a buffer at pH 5.2 and reacts with chloramine-T to form cyanogen chloride. Cyanogen chloride reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour, measured at 600nm. This method is compliant with NEPM Schedule B(3)
Total Cyanide by Segmented Flow Analyser	EK026SF	WATER	In house: Referenced to APHA 4500-CN C&O / ASTM D7511 / ISO 14403. Sodium hydroxide preserved samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM Schedule B(3)
Fluoride by Auto Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. 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)

COC 25/9 9:46.

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP

Client: Ramboll	Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001662	**Envirolab Services** 12 Ashley St, Chatswood, NSW 2067 Phone: 02 9910 6200 Fax :02 9910 6201 E-mail: ahie@envirolabservices.com.au Contact: Aileen Hie
Contact person: Jake Bourke		
Project Mgr: Kirsty Greenfield	PO No.:	
Sampler: Jake Bourke	Envirolab Quote No. :	
Address: Level 2 Suite 18, 50 Glebe Road, The Junction	Date results required: Or choose: standard / same day / 1 day / 2 day / 3 day *Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	**Envirolab Services WA t/a MPL** 16-18 Hayden Crt, Myaree WA 6154 Phone: 08 9317 2505 Fax :08 9317 4163 E-mail: lab@mpl.com.au Contact: Joshua Lim
Phone: (02) 49625444 Mob: 0467 580 473		
Fax:	Lab comments: Highly contaminated	
Email: jkirsch@ramboll.com; jbourke@ramboll.com		

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium	Comments
1	E4	21/09/2023		WATER	X	X	X	X	X	
2	E5D	21/09/2023		WATER	X	X	X	X	X	
3	F5	21/09/2023		WATER	X	X	X	X	X	
4	F6	21/09/2023		WATER	X	X	X	X	X	
5	G5	21/09/2023		WATER	X	X	X	X	X	
6	G6	21/09/2023		WATER	X	X	X	X	X	
7	N2	21/09/2023		WATER	X	X	X	X	X	
8	W5D	21/09/2023		WATER	X	X	X	X	X	
9	W7M	21/09/2023		WATER	X	X	X	X	X	

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

Job No: 33410

Date Received: 27/9/23
Time Received: 1455
Received By: KW
Temp: Cool/Ambient 2°C
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by (company):	Ramboll	Received by (company):	ELS SYD
Print Name:	Matilda Englert	Print Name:	Katy Wang
Date & Time:	21/09/2023	Date & Time:	27/9/23 1455
Signature:		Signature:	

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: 2°C (if applicable)
Transported by: Hand delivered / courier

ENVIROLAB GROUP

Client: Ramboll	Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001662	Envirolab Services 12 Ashley St, Chatswood, NSW 2067 Phone: 02 9910 6200 Fax :02 9910 6201 E-mail: ahie@envirolabservices.com.au Contact: Aileen Hie
Contact person: Matilda Englert	PO No.:	
Project Mgr: Kirsty Greenfield	Envirolab Quote No. :	
Sampler: Matilda Englert	Date results required:	
Address: Level 2 Suite 18, 50 Glebe Road, The Junction	Or choose: standard / same day / 1 day / 2 day / 3 day	Envirolab Services WA t/a MPL 16-18 Hayden Crt, Myaree WA 6154
Phone: (02) 49625444 Mob: 0467 580 473	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	Phone: 08 9317 2505 Fax :08 9317 4163
Fax:	Lab comments: Highly contaminated	E-mail: lab@mpl.com.au
Email: jkirsch@ramboll.com; jbourke@ramboll.com		Contact: Joshua Lim

Sample information					Tests Required													Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium	HOLD								Provide as much information about the sample as you can
10	G2		22/09/2023	WATER	X	X	X	X	X									
11	N8		22/09/2023	WATER	X	X	X	X	X									
12	N9		22/09/2023	WATER	X	X	X	X	X									Metals not field filtered
13	W1D		22/09/2023	WATER	X	X	X	X	X									
14	W2D		22/09/2023	WATER	X	X	X	X	X									
15	W3S		22/09/2023	WATER	X	X	X	X	X									#334100
16	W6D		22/09/2023	WATER	X	X	X	X	X									27/9 KW
17	D01_20230922		22/09/2023	WATER	X	X	X	X	X									
18	T01_20230922		22/09/2023	WATER	X	X	X	X	X									
19	R01_20230922		22/09/2023	WATER	X	X	X	X	X									

Relinquished by (company):	Ramboll	Received by (company):	*Lab use only:*
Print Name:	Matilda Englert	Print Name:	Samples Received: Cool or Ambient (circle one)
Date & Time:	22/09/2023	Date & Time:	Temperature Received at: (if applicable)
Signature:		Signature:	Transported by: Hand delivered / courier

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

SAMPLE RECEIPT ADVICE

Client Details

Client	Ramboll Australia Pty Ltd
Attention	J Kirsch

Sample Login Details

Your reference	Hydro Groundwater Plume Monitoring - 318001662
Envirolab Reference	334100
Date Sample Received	27/09/2023
Date Instructions Received	27/09/2023
Date Results Expected to be Reported	05/10/2023

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	19 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	2
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

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

Sample ID	Fluoride, F	Total Cyanide	Free Cyanide in Water	HM in water - dissolved	HM in water - total
E4	✓	✓	✓	✓	✓
E5D	✓	✓	✓	✓	✓
F5	✓	✓	✓	✓	✓
F6	✓	✓	✓	✓	✓
G5	✓	✓	✓	✓	✓
G6	✓	✓	✓	✓	✓
N2	✓	✓	✓	✓	✓
W5D	✓	✓	✓	✓	✓
W7M	✓	✓	✓	✓	✓
G2	✓	✓	✓	✓	✓
N8	✓	✓	✓	✓	✓
N9	✓	✓	✓	✓	✓
W1D	✓	✓	✓	✓	✓
W2D	✓	✓	✓	✓	✓
W3S	✓	✓	✓	✓	✓
W6D	✓	✓	✓	✓	✓
D01_20230922	✓	✓	✓	✓	✓
T01_20230922	✓	✓	✓	✓	✓
R01_20230922	✓	✓	✓	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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

CERTIFICATE OF ANALYSIS 334100

Client Details

Client	Ramboll Australia Pty Ltd
Attention	J Kirsch
Address	PO Box 560, North Sydney, NSW, 2060

Sample Details

Your Reference	**Hydro Groundwater Plume Monitoring - 318001662**
Number of Samples	19 Water
Date samples received	27/09/2023
Date completed instructions received	27/09/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	05/10/2023
Date of Issue	05/10/2023

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

Results Approved By
Diego Bigolin, Inorganics Supervisor
Loren Bardwell, Development Chemist

Authorised By
Nancy Zhang, Laboratory Manager

Miscellaneous Inorganics						
Our Reference		334100-1	334100-2	334100-3	334100-4	334100-5
Your Reference	UNITS	E4	E5D	F5	F6	G5
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Date analysed	-	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Fluoride, F	mg/L	710	8.6	0.2	0.4	0.1
Total Cyanide	mg/L	170	0.065	<0.004	<0.004	<0.004
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004

Miscellaneous Inorganics						
Our Reference		334100-6	334100-7	334100-8	334100-9	334100-10
Your Reference	UNITS	G6	N2	W5D	W7M	G2
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	22/09/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Date analysed	-	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Fluoride, F	mg/L	0.5	1.2	0.3	670	0.3
Total Cyanide	mg/L	<0.004	0.030	<0.004	100	<0.004
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004

Miscellaneous Inorganics						
Our Reference		334100-11	334100-12	334100-13	334100-14	334100-15
Your Reference	UNITS	N8	N9	W1D	W2D	W3S
Date Sampled		22/09/2023	22/09/2023	22/09/2023	22/09/2023	22/09/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Date analysed	-	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Fluoride, F	mg/L	0.4	92	8.3	1,100	140
Total Cyanide	mg/L	0.17	6.0	220	16	110
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	0.12	0.018

Miscellaneous Inorganics				
Our Reference		334100-16	334100-17	334100-19
Your Reference	UNITS	W6D	D01_20230922	R01_20230922
Date Sampled		22/09/2023	22/09/2023	22/09/2023
Type of sample		Water	Water	Water
Date prepared	-	28/09/2023	28/09/2023	28/09/2023
Date analysed	-	28/09/2023	28/09/2023	28/09/2023
Fluoride, F	mg/L	<0.1	0.3	<0.1
Total Cyanide	mg/L	0.11	<0.004	<0.004
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004

HM in water - dissolved						
Our Reference		334100-1	334100-2	334100-3	334100-4	334100-5
Your Reference	UNITS	E4	E5D	F5	F6	G5
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Date analysed	-	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Aluminium-Dissolved	µg/L	300	20	2,400	70	140

HM in water - dissolved						
Our Reference		334100-6	334100-7	334100-8	334100-9	334100-10
Your Reference	UNITS	G6	N2	W5D	W7M	G2
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	22/09/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Date analysed	-	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Aluminium-Dissolved	µg/L	17,000	3,600	<10	260	<10

HM in water - dissolved						
Our Reference		334100-11	334100-12	334100-13	334100-14	334100-15
Your Reference	UNITS	N8	N9	W1D	W2D	W3S
Date Sampled		22/09/2023	22/09/2023	22/09/2023	22/09/2023	22/09/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Date analysed	-	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Aluminium-Dissolved	µg/L	40	360	60	480	230

HM in water - dissolved				
Our Reference		334100-16	334100-17	334100-19
Your Reference	UNITS	W6D	D01_20230922	R01_20230922
Date Sampled		22/09/2023	22/09/2023	22/09/2023
Type of sample		Water	Water	Water
Date prepared	-	28/09/2023	28/09/2023	28/09/2023
Date analysed	-	28/09/2023	28/09/2023	28/09/2023
Aluminium-Dissolved	µg/L	610	<10	30

HM in water - total						
Our Reference		334100-1	334100-2	334100-3	334100-4	334100-5
Your Reference	UNITS	E4	E5D	F5	F6	G5
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Date analysed	-	29/09/2023	29/09/2023	29/09/2023	29/09/2023	29/09/2023
Aluminium-Total	µg/L	2,400	400	3,100	300	180

HM in water - total						
Our Reference		334100-6	334100-7	334100-8	334100-9	334100-10
Your Reference	UNITS	G6	N2	W5D	W7M	G2
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	22/09/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Date analysed	-	29/09/2023	29/09/2023	29/09/2023	29/09/2023	29/09/2023
Aluminium-Total	µg/L	18,000	5,000	1,000	3,200	70

HM in water - total						
Our Reference		334100-11	334100-12	334100-13	334100-14	334100-15
Your Reference	UNITS	N8	N9	W1D	W2D	W3S
Date Sampled		22/09/2023	22/09/2023	22/09/2023	22/09/2023	22/09/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Date analysed	-	29/09/2023	29/09/2023	29/09/2023	29/09/2023	29/09/2023
Aluminium-Total	µg/L	920	35,000	210	530	7,200

HM in water - total				
Our Reference		334100-16	334100-17	334100-19
Your Reference	UNITS	W6D	D01_20230922	R01_20230922
Date Sampled		22/09/2023	22/09/2023	22/09/2023
Type of sample		Water	Water	Water
Date prepared	-	28/09/2023	28/09/2023	28/09/2023
Date analysed	-	29/09/2023	29/09/2023	29/09/2023
Aluminium-Total	µg/L	3,000	100	30

Method ID	Methodology Summary
Inorg-014	Cyanide - free, total, weak acid dissociable by segmented flow analyser (in line dialysis with colourimetric finish). Solids/Filters and sorbents are extracted in a caustic media prior to analysis. Impingers are pH adjusted as required prior to analysis. Cyanides amenable to Chlorination - samples are analysed untreated and treated with hypochlorite to assess the potential for chlorination of cyanide forms. Based on APHA latest edition, 4500-CN_G,H.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Salt forms (e.g. FeO, PbO, ZnO) are determinined stoichiometrically from the base metal concentration.

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	334100-2
Date prepared	-			28/09/2023	1	28/09/2023	28/09/2023		28/09/2023	28/09/2023
Date analysed	-			28/09/2023	1	28/09/2023	28/09/2023		28/09/2023	28/09/2023
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	1	710	740	4	93	#
Total Cyanide	mg/L	0.004	Inorg-014	<0.004	1	170	170	0	102	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	<0.004	1	<0.004	<0.004	0	100	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	334100-19
Date prepared	-			[NT]	11	28/09/2023	28/09/2023		[NT]	28/09/2023
Date analysed	-			[NT]	11	28/09/2023	28/09/2023		[NT]	28/09/2023
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	11	0.4	0.4	0	[NT]	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	11	0.17	0.17	0	[NT]	98
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	11	<0.004	<0.004	0	[NT]	92

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	334100-2
Date prepared	-			28/09/2023	1	28/09/2023	28/09/2023		28/09/2023	28/09/2023
Date analysed	-			28/09/2023	1	28/09/2023	28/09/2023		28/09/2023	28/09/2023
Aluminium-Dissolved	µg/L	10	Metals-022	<10	1	300	310	3	101	91

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	28/09/2023	28/09/2023		[NT]	[NT]
Date analysed	-			[NT]	11	28/09/2023	28/09/2023		[NT]	[NT]
Aluminium-Dissolved	µg/L	10	Metals-022	[NT]	11	40	40	0	[NT]	[NT]

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	334100-2
Date prepared	-			28/09/2023	1	28/09/2023	28/09/2023		28/09/2023	28/09/2023
Date analysed	-			29/09/2023	1	29/09/2023	29/09/2023		29/09/2023	29/09/2023
Aluminium-Total	µg/L	10	Metals-022	<10	1	2400	2100	13	105	#

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	28/09/2023	28/09/2023		[NT]	[NT]
Date analysed	-			[NT]	11	29/09/2023	29/09/2023		[NT]	[NT]
Aluminium-Total	µg/L	10	Metals-022	[NT]	11	920	1100	18	[NT]	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Report Comments

MISC_INORG: FLUORIDE # Percent recovery for the matrix spike is not possible to report as the high concentration of analytes in sample 334100-2 have caused interference.

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

ENVIROLAB GROUP

Client: Ramboll	Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001662	Envirolab Services 12 Ashley St, Chatswood, NSW 2067 Phone: 02 9910 6200 Fax :02 9910 6201 E-mail: ahie@envirolabservices.com.au Contact: Aileen Hie
Contact person: Matilda Englert		
Project Mgr: Kirsty Greenfield	PO No.:	
Sampler: Matilda Englert	Envirolab Quote No. :	
Address: Level 2 Suite 18, 50 Glebe Road,	Date results required:	
The Junction		Envirolab Services WA t/a MPL 16-18 Hayden Crt, Myaree WA 6154 Phone: 08 9317 2505 Fax :08 9317 4163 E-mail: lab@mpl.com.au Contact: Joshua Lim
	Or choose: standard / same day / 1 day / 2 day / 3 day	
Phone: (02) 49625444 Mob: 0467 580 473	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	
Fax:	Lab comments: Highly contaminated	
Email: jkirsch@ramboll.com; jbourke@ramboll.com		

Sample information					Tests Required							Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium	HOLD		Provide as much information about the sample as you can
10	G2		22/09/2023	WATER	X	X	X	X	X			
11	N8		22/09/2023	WATER	X	X	X	X	X			
12	N9		22/09/2023	WATER	X	X	X	X	X			Metals not field filtered
13	W1D		22/09/2023	WATER	X	X	X	X	X			
14	W2D		22/09/2023	WATER	X	X	X	X	X			
15	W3S		22/09/2023	WATER	X	X	X	X	X			#334100
16	W6D		22/09/2023	WATER	X	X	X	X	X			27/9 KW
17	D01_20230922		22/09/2023	WATER	X	X	X	X	X			
18 SO	T01_20230922		22/09/2023	WATER	X	X	X	X	X			
19	R01_20230922		22/09/2023	WATER	X	X	X	X	X			
	Relinquished by: ELS SYD											
	Grace Z											
	29/09/23 1130											

(1)

Environmental Division
Sydney
Work Order Reference
ES2333605

Telephone : + 61-2-8784 8555

Relinquished by (company):	Ramboll	Received by (company): ALS	*Lab use only:*
Print Name:	Matilda Englert	Print Name: [illegible]	Samples Received: Cool or Ambient (circle one)
Date & Time:	22/09/2023	Date & Time: 29/9/23 1430	Temperature Received at: (if applicable)
Signature:		Signature:	Transported by: Hand delivered / courier

Anna Bui

From: Jake Bourke <jbourke@ramboll.com>
Sent: Thursday, 28 September 2023 4:43 PM
To: Anna Bui; Jordyn Kirsch
Subject: RE: Sample Receipt for 334100 Hydro Groundwater Plume Monitoring - 318001662

Hi there,

Could you please forward sample T01_20230922 to ALS for analysis?

Relinquished by ELS SYD
Grace Zhang
29/09/23 1130

Kind regards
Jake Bourke

Consultant

jbourke@ramboll.com

Ramboll Australia Pty Ltd.
ACN 095 437 442
ABN 49 095 437 442

Classification: Confidential

From: Anna Bui <ABui@envirolab.com.au>
Sent: Wednesday, 27 September 2023 8:07 PM
To: Jake Bourke <jbourke@ramboll.com>; Jordyn Kirsch <jkirsch@ramboll.com>
Subject: Sample Receipt for 334100 Hydro Groundwater Plume Monitoring - 318001662

Please refer to attached for:
a copy of the COC/paperwork received from you
a copy of our Sample Receipt Advice (SRA)
Please open and read the SRA as it contains important information.
Please let the lab know immediately if there are any issues.

Results will be available by 6.30pm on the date indicated.

PLEASE NOTE COMBO PRICES WILL ONLY APPLY IF COMBOS ARE SELECTED ON COC.

We have a new reporting format and would welcome your feedback. Sydney@envirolab.com.au

Please note that subcontracted testing or non routine testing may take significantly longer than just the standard 5 day TAT, contact the lab to get an approximate due date.

Enquiries should be made directly to:
customerservice@envirolab.com.au

Regards

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2333605**

Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Contact	: Customer Services ES
Address	: EASTPOINT COMPLEX SUITE 19B, LEVEL 2 50 GLEBE ROAD THE JUNCTION NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: jkirsch@ramboll.com	E-mail	: ALSEnviro.Sydney@ALSGlobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: Hydro Groundwater Plume Monitoring - 318001662	Page	: 1 of 2
Order number	: ----	Quote number	: EB2017ENVIAUS0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	:		

Dates

Date Samples Received	: 29-Sep-2023 14:30	Issue Date	: 05-Oct-2023
Client Requested Due Date	: 09-Oct-2023	Scheduled Reporting Date	: **09-Oct-2023**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 11 - Ice Bricks present
Receipt Detail	: FOAM ESKY	No. of samples received / analysed	: 1 / 1

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 ± 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 - EG020F Dissolved Metals by ICP/MS	WATER - EG020T Total Metals by ICP/MS (including digestion)	WATER - EK025SF Free CN By Segmented Flow Analyser	WATER - EK026SF Total Cyanide by Segmented Flow Analyser	WATER - EK040-P Fluoride (Auto Titrator)
ES2333605-001	22-Sep-2023 00:00	T01_20230922	✓	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE		
- A4 - AU Tax Invoice (INV)	Email	AsiaPac-Accounts@Ramboll.com
JAKE BOURKE		
- *AU Certificate of Analysis - NATA (COA)	Email	JBOURKE@ramboll.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	JBOURKE@ramboll.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	JBOURKE@ramboll.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	JBOURKE@ramboll.com
- Chain of Custody (CoC) (COC)	Email	JBOURKE@ramboll.com
- EDI Format - EQUIS_ENVIRON (EQUIS_ENVIRON)	Email	JBOURKE@ramboll.com
- EDI Format - XTab (XTAB)	Email	JBOURKE@ramboll.com
JORDYN KIRSCH		
- *AU Certificate of Analysis - NATA (COA)	Email	jkirsch@ramboll.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jkirsch@ramboll.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jkirsch@ramboll.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jkirsch@ramboll.com
- Chain of Custody (CoC) (COC)	Email	jkirsch@ramboll.com
- EDI Format - EQUIS_ENVIRON (EQUIS_ENVIRON)	Email	jkirsch@ramboll.com
- EDI Format - XTab (XTAB)	Email	jkirsch@ramboll.com

CERTIFICATE OF ANALYSIS

Work Order	: **ES2333605**	Page	: 1 of 2
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Contact	: Customer Services ES
Address	: EASTPOINT COMPLEX SUITE 19B, LEVEL 2 50 GLEBE ROAD THE JUNCTION NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: Hydro Groundwater Plume Monitoring - 318001662	Date Samples Received	: 29-Sep-2023 14:30
Order number	: ----	Date Analysis Commenced	: 05-Oct-2023
C-O-C number	: ----	Issue Date	: 09-Oct-2023 16:57
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

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.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)				*Sample ID*	**T01_20230922**	**----**	**----**	**----**	**----**
				Sampling date / time	22-Sep-2023 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**ES2333605-001**	--------	--------	--------	--------
					Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	**----**	**----**	**----**	**----**
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.02**	**----**	**----**	**----**	**----**
EK025SF: Free CN by Segmented Flow Analyser									
Free Cyanide	----	0.004	mg/L		<0.004	**----**	**----**	**----**	**----**
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	**----**	**----**	**----**	**----**
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.4**	**----**	**----**	**----**	**----**

QUALITY CONTROL REPORT

Work Order	: **ES2333605**	Page	: 1 of 3
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Contact	: Customer Services ES
Address	: EASTPOINT COMPLEX SUITE 19B, LEVEL 2 50 GLEBE ROAD THE JUNCTION NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: Hydro Groundwater Plume Monitoring - 318001662	Date Samples Received	: 29-Sep-2023
Order number	: ----	Date Analysis Commenced	: 05-Oct-2023
C-O-C number	: ----	Issue Date	: 09-Oct-2023
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 1		
No. of samples analysed	: 1		

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*
Ankit Joshi	Senior Chemist - Inorganics	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**

				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: 5342030)									
ES2333605-001	T01_20230922	EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 5342038)									
ES2333556-038	Anonymous	EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK025SF: Free CN by Segmented Flow Analyser (QC Lot: 5342152)									
ES2333605-001	T01_20230922	EK025SF: Free Cyanide	----	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 5342153)									
WN2311969-002	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
ES2333605-001	T01_20230922	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 5341784)									
ES2334202-002	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	1.0	1.1	0.0	0% - 50%
ES2334202-009	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	1.0	1.1	0.0	0% - 50%

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 5342030)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	93.7	80.0	116
EG020T: Total Metals by ICP-MS (QCLot: 5342038)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	98.2	82.0	120
EK025SF: Free CN by Segmented Flow Analyser (QCLot: 5342152)								
EK025SF: Free Cyanide	----	0.004	mg/L	<0.004	0.2 mg/L	108	88.0	128
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 5342153)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	107	73.0	133
EK040P: Fluoride by PC Titrator (QCLot: 5341784)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	94.6	82.0	116

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			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK025SF: Free CN by Segmented Flow Analyser (QCLot: 5342152)							
ES2333605-001	T01_20230922	EK025SF: Free Cyanide	----	0.2 mg/L	109	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 5342153)							
ES2333605-001	T01_20230922	EK026SF: Total Cyanide	57-12-5	0.2 mg/L	106	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 5341784)							
ES2334202-001	Anonymous	EK040P: Fluoride	16984-48-8	5 mg/L	88.9	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2333605**	Page	: 1 of 4
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Telephone	: +61-2-8784 8555
Project	: Hydro Groundwater Plume Monitoring - 318001662	Date Samples Received	: 29-Sep-2023
Site	: ----	Issue Date	: 09-Oct-2023
Sampler	: ----	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

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 / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
	0				
Matrix Spikes (MS)					
Dissolved Metals by ICP-MS - Suite A	0	1	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	0	3	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
T01_20230922	**22-Sep-2023**	**----**	----	**----**	**06-Oct-2023**	20-Mar-2024	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
T01_20230922	**22-Sep-2023**	**06-Oct-2023**	20-Mar-2024	✓	**06-Oct-2023**	20-Mar-2024	✓
EK025SF: Free CN by Segmented Flow Analyser							
Opaque plastic bottle - NaOH (EK025SF)							
T01_20230922	**22-Sep-2023**	**----**	----	**----**	**06-Oct-2023**	06-Oct-2023	✓
EK026SF: Total CN by Segmented Flow Analyser							
Opaque plastic bottle - NaOH (EK026SF)							
T01_20230922	**22-Sep-2023**	**----**	----	**----**	**06-Oct-2023**	06-Oct-2023	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
T01_20230922	**22-Sep-2023**	**----**	----	**----**	**05-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)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	1	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	1	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	3	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	0	1	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	0	3	**0.00**	**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
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
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.
Free CN by Segmented Flow Analyser	EK025SF	WATER	In house: Referenced to ASTM D7237, APHA 4500-CN-C&O and ISO 14403: Using an automated segmented flow analyser, a sample at high pH (sodium hydroxide preserved) is buffered to pH 6.0. The hydrogen cyanide present passes across a gas dialysis membrane into an acceptor stream consisting of 0.01 M sodium hydroxide. The acceptor stream mixes with a buffer at pH 5.2 and reacts with chloramine-T to form cyanogen chloride. Cyanogen chloride reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour, measured at 600nm. This method is compliant with NEPM Schedule B(3)
Total Cyanide by Segmented Flow Analyser	EK026SF	WATER	In house: Referenced to APHA 4500-CN C&O / ASTM D7511 / ISO 14403. Sodium hydroxide preserved samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM Schedule B(3)
Fluoride by Auto Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. 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)

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP

Client: Ramboll	**Client Project Name / Number / Site etc (ie report title):** Hydro Groundwater Plume Monitoring - 318001662	**Envirolab Services** 12 Ashley St, Chatswood, NSW 2067 Phone: 02 9910 6200 Fax :02 9910 6201 E-mail: ahie@envirolabservices.com.au Contact: Aileen Hie	
Contact person: Jake Bourke			
Project Mgr: Kirsty Greenfield	**PO No.:**		
Sampler: Jake Bourke	**Envirolab Quote No. :**		
Address: Level 2 Suite 18, 50 Glebe Road,	**Date results required:**	**Envirolab Services WA t/a MPL** 16-18 Hayden Crt, Myaree WA 6154 Phone: 08 9317 2505 Fax :08 9317 4163 E-mail: lab@mpl.com.au Contact: Joshua Lim	
The Junction			
	Or choose: standard / same day / 1 day / 2 day / 3 day		
Phone: (02) 49625444 **Mob:** 0467 580 473	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*		
Fax:	**Lab comments:** Highly contaminated		
Email: jkirsch@ramboll.com; jbourke@ramboll.com			

Sample information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium				→ Extra	Pick	DL				Provide as much information about the sample as you can
1	D01_20231127		27/11/2023	WATER	X	X	X	X	X										
2	T01_20231127		27/11/2023	WATER	X	X	X	X	X				13	W1S					
3	F6		27/11/2023	WATER	X	X	X	X	X				14	W1D					
4	G5		27/11/2023	WATER	X	X	X	X	X				15	W2D					
5	G6		27/11/2023	WATER	X	X	X	X	X				16	E4					
6	W5D		27/11/2023	WATER	X	X	X	X	X				17	E5D					
7	G2		27/11/2023	WATER	X	X	X	X	X										
8	N2		27/11/2023	WATER	X	X	X	X	X										
9	N8		27/11/2023	WATER	X	X	X	X	X										
10	W6D		27/11/2023	WATER	X	X	X	X	X										
11	F5		27/11/2023	WATER	X	X	X	X	X										
12	W3S		27/11/2023	WATER	X	X	X	X	X										

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

Job No: 339103
Date Received: 30/11/23
Time Received: 1030
Received By: Paul
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by (company):	Ramboll	**Received by (company):** ELS	***Lab use only:***
Print Name:	Matilda Englert	**Print Name:** Paul	**Samples Received:** Cool or Ambient (circle one)
Date & Time:	27/11/2023	**Date & Time:** 30/11/23 1030	**Temperature Received at:** 14 (if applicable)
Signature:		**Signature:**	**Transported by:** Hand delivered / courier

ENVIROLAB GROUP

Client: Ramboll	Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001662	Envirolab Services 12 Ashley St, Chatswood, NSW 2067 Phone: 02 9910 6200 Fax :02 9910 6201 E-mail: ahie@envirolabservices.com.au Contact: Aileen Hie
Contact person: Matilda Englert	PO No.:	
Project Mgr: Kirsty Greenfield	Envirolab Quote No. :	
Sampler: Matilda Englert	Date results required:	
Address: Level 2 Suite 18, 50 Glebe Road, The Junction	Or choose: standard / same day / 1 day / 2 day / 3 day	Envirolab Services WA t/a MPL 16-18 Hayden Crt, Myaree WA 6154 Phone: 08 9317 2505 Fax :08 9317 4163 E-mail: lab@mpl.com.au Contact: Joshua Lim
Phone: (02) 49625444 Mob: 0467 580 473	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	
Fax:	Lab comments: Highly contaminated	
Email: jkirsch@ramboll.com; jbourke@ramboll.com		

Sample information					Tests Required													Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium	HOLD								Provide as much information about the sample as you can
13	W2D		28/11/2023	WATER	X	X	X	X	X									
14	E5D		28/11/2023	WATER	X	X	X	X	X									
15	W1D		28/11/2023	WATER	X	X	X	X	X									
16 ~~DUP~~	W1S		28/11/2023	WATER	X	X	X	X	X									
DUP	W2S		28/11/2023	WATER	X	X	X	X	X									
17	E4		28/11/2023	WATER	X	X	X	X	X									

Relinquished by (company): Ramboll	Received by (company): ELS	*Lab use only:* 339103,
Print Name: Matilda Englert	Print Name: Paul	Samples Received: Cool or Ambient (circle one)
Date & Time: 28/11/2023	Date & Time: 30/11/23 1030	Temperature Received at: (if applicable)
Signature:	Signature:	Transported by: Hand delivered / courier

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

SAMPLE RECEIPT ADVICE

Client Details

Client	Ramboll Australia Pty Ltd
Attention	J Kirsch

Sample Login Details

Your reference	Hydro Groundwater Plume Monitoring - 318001662
Envirolab Reference	339103
Date Sample Received	30/11/2023
Date Instructions Received	30/11/2023
Date Results Expected to be Reported	07/12/2023

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	17 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	14
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Extra samples received (#13-17)

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

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

Sample ID	HM in water - dissolved	HM in water - total	Free Cyanide in Water	Total Cyanide	Fluoride, F
D01_20231127	✓	✓	✓	✓	✓
T01_20231127	✓	✓	✓	✓	✓
F6	✓	✓	✓	✓	✓
G5	✓	✓	✓	✓	✓
G6	✓	✓	✓	✓	✓
W5D	✓	✓	✓	✓	✓
G2	✓	✓	✓	✓	✓
N2	✓	✓	✓	✓	✓
N8	✓	✓	✓	✓	✓
W6D	✓	✓	✓	✓	✓
F5	✓	✓	✓	✓	✓
W3S	✓	✓	✓	✓	✓
W2D	✓	✓	✓	✓	✓
E5D	✓	✓	✓	✓	✓
W1D	✓	✓	✓	✓	✓
W1S	✓	✓	✓	✓	✓
E4	✓	✓	✓	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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

CERTIFICATE OF ANALYSIS 339103

Client Details

Client	Ramboll Australia Pty Ltd
Attention	J Kirsch
Address	PO Box 560, North Sydney, NSW, 2060

Sample Details

Your Reference	**Hydro Groundwater Plume Monitoring - 318001662**
Number of Samples	17 Water
Date samples received	30/11/2023
Date completed instructions received	30/11/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	07/12/2023
Date of Issue	07/12/2023

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

Results Approved By
Diego Bigolin, Inorganics Supervisor
Loren Bardwell, Development Chemist

Authorised By
Nancy Zhang, Laboratory Manager

HM in water - dissolved						
Our Reference		339103-1	339103-2	339103-3	339103-4	339103-5
Your Reference	UNITS	D01_20231127	T01_20231127	F6	G5	G6
Date Sampled		27/11/2023	27/11/2023	27/11/2023	27/11/2023	27/11/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	05/12/2023	05/12/2023	05/12/2023	05/12/2023	05/12/2023
Date analysed	-	05/12/2023	05/12/2023	05/12/2023	05/12/2023	05/12/2023
Aluminium-Dissolved	µg/L	<10	<10	<10	90	20,000

HM in water - dissolved						
Our Reference		339103-6	339103-7	339103-8	339103-9	339103-10
Your Reference	UNITS	W5D	G2	N2	N8	W6D
Date Sampled		27/11/2023	27/11/2023	27/11/2023	27/11/2023	27/11/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	05/12/2023	05/12/2023	05/12/2023	05/12/2023	05/12/2023
Date analysed	-	05/12/2023	05/12/2023	05/12/2023	05/12/2023	05/12/2023
Aluminium-Dissolved	µg/L	<10	<10	4,000	40	<10

HM in water - dissolved						
Our Reference		339103-11	339103-12	339103-13	339103-14	339103-15
Your Reference	UNITS	F5	W3S	W2D	E5D	W1D
Date Sampled		27/11/2023	27/11/2023	28/11/2023	28/11/2023	28/11/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	05/12/2023	05/12/2023	05/12/2023	05/12/2023	05/12/2023
Date analysed	-	05/12/2023	05/12/2023	05/12/2023	05/12/2023	05/12/2023
Aluminium-Dissolved	µg/L	2,500	340	430	10	80

HM in water - dissolved			
Our Reference		339103-16	339103-17
Your Reference	UNITS	W1S	E4
Date Sampled		28/11/2023	28/11/2023
Type of sample		Water	Water
Date prepared	-	05/12/2023	05/12/2023
Date analysed	-	05/12/2023	05/12/2023
Aluminium-Dissolved	µg/L	130	260

HM in water - total						
Our Reference		339103-1	339103-2	339103-3	339103-4	339103-5
Your Reference	UNITS	D01_20231127	T01_20231127	F6	G5	G6
Date Sampled		27/11/2023	27/11/2023	27/11/2023	27/11/2023	27/11/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	06/12/2023	06/12/2023	06/12/2023	06/12/2023	06/12/2023
Date analysed	-	06/12/2023	06/12/2023	06/12/2023	06/12/2023	06/12/2023
Aluminium-Total	µg/L	180	160	<10	130	18,000

HM in water - total						
Our Reference		339103-6	339103-7	339103-8	339103-9	339103-10
Your Reference	UNITS	W5D	G2	N2	N8	W6D
Date Sampled		27/11/2023	27/11/2023	27/11/2023	27/11/2023	27/11/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	06/12/2023	06/12/2023	06/12/2023	06/12/2023	06/12/2023
Date analysed	-	06/12/2023	06/12/2023	06/12/2023	06/12/2023	06/12/2023
Aluminium-Total	µg/L	200	180	4,500	1,600	450

HM in water - total						
Our Reference		339103-11	339103-12	339103-13	339103-14	339103-15
Your Reference	UNITS	F5	W3S	W2D	E5D	W1D
Date Sampled		27/11/2023	27/11/2023	28/11/2023	28/11/2023	28/11/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	06/12/2023	06/12/2023	06/12/2023	06/12/2023	06/12/2023
Date analysed	-	06/12/2023	06/12/2023	06/12/2023	06/12/2023	06/12/2023
Aluminium-Total	µg/L	2,700	7,700	420	2,000	490

HM in water - total			
Our Reference		339103-16	339103-17
Your Reference	UNITS	W1S	E4
Date Sampled		28/11/2023	28/11/2023
Type of sample		Water	Water
Date prepared	-	06/12/2023	06/12/2023
Date analysed	-	06/12/2023	06/12/2023
Aluminium-Total	µg/L	6,100	11,000

Miscellaneous Inorganics						
Our Reference		339103-1	339103-2	339103-3	339103-4	339103-5
Your Reference	UNITS	D01_20231127	T01_20231127	F6	G5	G6
Date Sampled		27/11/2023	27/11/2023	27/11/2023	27/11/2023	27/11/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	01/12/2023	01/12/2023	01/12/2023	01/12/2023	01/12/2023
Date analysed	-	01/12/2023	01/12/2023	01/12/2023	01/12/2023	01/12/2023
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004
Fluoride, F	mg/L	0.3	0.3	0.5	0.4	0.6

Miscellaneous Inorganics						
Our Reference		339103-6	339103-7	339103-8	339103-9	339103-10
Your Reference	UNITS	W5D	G2	N2	N8	W6D
Date Sampled		27/11/2023	27/11/2023	27/11/2023	27/11/2023	27/11/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	01/12/2023	01/12/2023	01/12/2023	01/12/2023	01/12/2023
Date analysed	-	01/12/2023	01/12/2023	01/12/2023	01/12/2023	01/12/2023
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide	mg/L	<0.004	<0.004	0.013	0.53	<0.004
Fluoride, F	mg/L	0.4	0.3	1.2	0.3	<0.1

Miscellaneous Inorganics						
Our Reference		339103-11	339103-12	339103-13	339103-14	339103-15
Your Reference	UNITS	F5	W3S	W2D	E5D	W1D
Date Sampled		27/11/2023	27/11/2023	28/11/2023	28/11/2023	28/11/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	01/12/2023	01/12/2023	01/12/2023	01/12/2023	01/12/2023
Date analysed	-	01/12/2023	01/12/2023	01/12/2023	01/12/2023	01/12/2023
Free Cyanide in Water	mg/L	<0.004	0.29	0.15	<0.004	<0.004
Total Cyanide	mg/L	<0.004	32	220	0.90	0.82
Fluoride, F	mg/L	0.3	180	1,100	9.1	9.4

Miscellaneous Inorganics			
Our Reference		339103-16	339103-17
Your Reference	UNITS	W1S	E4
Date Sampled		28/11/2023	28/11/2023
Type of sample		Water	Water
Date prepared	-	01/12/2023	01/12/2023
Date analysed	-	01/12/2023	01/12/2023
Free Cyanide in Water	mg/L	<0.004	0.21
Total Cyanide	mg/L	0.94	170
Fluoride, F	mg/L	8.7	760

Method ID	Methodology Summary
Inorg-014	Cyanide - free, total, weak acid dissociable by segmented flow analyser (in line dialysis with colourimetric finish). Solids/Filters and sorbents are extracted in a caustic media prior to analysis. Impingers are pH adjusted as required prior to analysis. Cyanides amenable to Chlorination - samples are analysed untreated and treated with hypochlorite to assess the potential for chlorination of cyanide forms. Based on APHA latest edition, 4500-CN_G,H.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Salt forms (e.g. FeO, PbO, ZnO) are determinined stoichiometrically from the base metal concentration.

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W6	339103-2
Date prepared	-			05/12/2023	1	05/12/2023	05/12/2023		05/12/2023	05/12/2023
Date analysed	-			05/12/2023	1	05/12/2023	05/12/2023		05/12/2023	05/12/2023
Aluminium-Dissolved	µg/L	10	Metals-022	<10	1	<10	<10	0	89	83

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	05/12/2023	05/12/2023		[NT]	[NT]
Date analysed	-			[NT]	11	05/12/2023	05/12/2023		[NT]	[NT]
Aluminium-Dissolved	µg/L	10	Metals-022	[NT]	11	2500	2400	4	[NT]	[NT]

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	339103-2
Date prepared	-			06/12/2023	1	06/12/2023	06/12/2023		06/12/2023	06/12/2023
Date analysed	-			06/12/2023	1	06/12/2023	06/12/2023		06/12/2023	06/12/2023
Aluminium-Total	µg/L	10	Metals-022	<10	1	180	160	12	112	#

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	06/12/2023	06/12/2023		[NT]	[NT]
Date analysed	-			[NT]	11	06/12/2023	06/12/2023		[NT]	[NT]
Aluminium-Total	µg/L	10	Metals-022	[NT]	11	2700	2700	0	[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	339103-2
Date prepared	-			01/12/2023	1	01/12/2023	01/12/2023		01/12/2023	01/12/2023
Date analysed	-			01/12/2023	1	01/12/2023	01/12/2023		01/12/2023	01/12/2023
Free Cyanide in Water	mg/L	0.004	Inorg-014	<0.004	1	<0.004	<0.004	0	98	96
Total Cyanide	mg/L	0.004	Inorg-014	<0.004	1	<0.004	<0.004	0	100	89
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	1	0.3	0.3	0	100	104

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	10	01/12/2023	06/12/2023		[NT]	[NT]
Date analysed	-			[NT]	10	01/12/2023	06/12/2023		[NT]	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	10	<0.004	[NT]		[NT]	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	10	<0.004	[NT]		[NT]	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	10	<0.1	<0.1	0	[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	01/12/2023	01/12/2023		[NT]	[NT]
Date analysed	-			[NT]	11	01/12/2023	01/12/2023		[NT]	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	11	<0.004	<0.004	0	[NT]	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	11	<0.004	<0.004	0	[NT]	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	11	0.3	[NT]		[NT]	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Report Comments

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

APPENDIX 6
CALIBRATION CERTIFICATES

Water Level Meter Calibration

Instrument: Solinst Water Level Meter (150m)
Serial No: 556202

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

Certificate of Calibration

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

Calibrated by: **Jake Bourke**

Calibration date: **7/05/2023**

Multi-Parameter Water Quality Meter Calibration

Instrument: Horiba U-52G/10m
Control Unit Serial No: TH06G239
Sensor Probe Unit Serial No: 4KV0033X

Certificate of Calibration

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

Parameter	Units	Temp. (°C)	Pre Calibratio	Calibratio n Value	Post Calibratio	Comment
pH	pH	25.52	3.99	4.01	4.01	Pass
pH	pH	25.66	7.98	7.00	7.00	Pass
pH	pH	25.58	10.07	9.96	9.96	Pass
ORP	mV	-	267.00	240	240	Pass
Conductivity	mS/cm	-	0.000	0.000	0.000	Pass
Conductivity	mS/cm	25.21	0.553	0.718	0.718	Pass
Conductivity	mS/cm	24.97	6.19	6.67	6.67	Pass
Conductivity	mS/cm	24.98	54.7	58.6	58.6	Pass
Turbidity	NTU	-	1.3	0.0	0.0	Pass
Turbidity	NTU	-	8.0	8.0	8.0	Pass
Turbidity	NTU	-	78.5	80.0	80.0	Pass
Turbidity	NTU	-	411	400	400	Pass
D.O. Zero	mg/L	-	0.00	0.00	0.00	Pass
D.O. Span	mg/L	24.91	7.59	8.24	8.24	Pass

Calibrated by: **Jake Bourke**

Calibration date: **22/03/2023**

Table A: Change in pH with temperature (°C)

Temperature (°C)	pH 4 standard solution	pH 7 standard solution	pH 10 standard solution
5	4.00	7.09	10.24
10	4.00	7.06	10.19
15	4.00	7.04	10.12
20	4.00	7.02	10.06
30	4.01	7.00	9.96
35	4.02	6.99	9.92
40	4.03	6.97	9.90
50	4.06	6.95	9.82

Table B: Change in Conductivity with temperature (°C)

Temperature (°C)	Standard solution (0.718 mS/cm)	Standard solution (6.67 mS/cm)	Standard solution (58.6 mS/cm)
10	0.512	4.76	41.80
11	0.526	4.88	42.90
12	0.540	5.01	44.10
13	0.533	0.51	45.20
14	0.567	5.27	46.30
15	0.581	5.39	47.40
16	0.595	5.52	48.50
17	0.608	5.65	49.60
18	0.622	5.87	50.80
19	0.636	5.90	51.90
20	0.649	6.03	53.00
21	0.663	6.16	54.10
22	0.677	6.29	55.20
23	0.691	6.41	56.40
24	0.704	6.54	57.50
25	0.718	6.67	58.60
26	0.732	6.79	59.70
27	0.745	6.92	60.80
28	0.759	7.05	62.00
29	0.773	7.18	63.10
30	0.787	7.30	64.20
31	0.800	7.43	65.30

Table C: Change in Dissolved Oxygen with Temperature at 100% Relative Humidity (Altitude:sea level)

Temperature	DO (100% R.H.)
(Celsius)	(ppm, mg/L)
0.00	14.60
1.00	14.19
2.00	13.81
3.00	13.44
4.00	13.09
5.00	12.75
6.00	12.43
7.00	12.12
8.00	11.83
9.00	11.55
10.00	11.27
11.00	11.01
12.00	10.76
13.00	10.52
14.00	10.29
15.00	10.07
16.00	9.85
17.00	9.65
18.00	9.45
19.00	9.26
20.00	9.07
21.00	8.90
22.00	8.72
23.00	8.56
24.00	8.40
25.00	8.24
26.00	8.09
27.00	7.95
28.00	7.81
29.00	7.67
30.00	7.54
31.00	7.41
32.00	7.28

Values are for pressure = 760 mm Hg for measurements at sea level.
For a given temperature, the concentration of dissolved oxygen concentration decreases by 0.3 mg/L with every 500 ft (152.4 m) increase in altitude.

Water Level Meter Calibration

Instrument: Solinst Water Level Meter (150m)
Serial No: 556202

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

Certificate of Calibration

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

Calibrated by: **Jake Bourke**

Calibration date: **7/05/2023**

Multi-Parameter Water Quality Meter Calibration

Instrument: Horiba U-52G/10m
Control Unit Serial No: TH06G239
Sensor Probe Unit Serial No: 4KV0033X

Certificate of Calibration

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

Parameter	Units	Temp. (°C)	Pre Calibratio	Calibratio n Value	Post Calibratio	Comment
pH	pH	18.19	7.23	7.02	7.02	Pass
pH	pH	17.56	4.14	4.00	4.00	Pass
pH	pH	17.78	9.76	10.06	10.06	Pass
ORP	mV	-	237	240	240	Pass
Conductivity	mS/cm	14.64	0.000	0.000	0.000	Pass
Conductivity	mS/cm	18.21	0.678	0.622	0.622	Pass
Conductivity	mS/cm	18.44	5.52	5.78	5.78	Pass
Conductivity	mS/cm	18.43	31.4	50.8	50.8	Pass
Turbidity	NTU	-	0.0	0.0	0.0	Pass
Turbidity	NTU	-	8.4	8.0	8.0	Pass
Turbidity	NTU	-	87.2	80.0	80.0	Pass
Turbidity	NTU	-	398	400	400	Pass
D.O. Zero	mg/L	-	0.00	0.00	0.00	Pass
D.O. Span	mg/L	24.91	7.59	8.24	8.24	Pass

Calibrated by: **Jake Bourke, Matilda Englert, Isobel Marshall, Erin Jacob**

Calibration date: **25/05/2023**

Table A: Change in pH with temperature (°C)

Temperature (°C)	pH 4 standard solution	pH 7 standard solution	pH 10 standard solution
5	4.00	7.09	10.24
10	4.00	7.06	10.19
15	4.00	7.04	10.12
20	4.00	7.02	10.06
30	4.01	7.00	9.96
35	4.02	6.99	9.92
40	4.03	6.97	9.90
50	4.06	6.95	9.82

Table B: Change in Conductivity with temperature (°C)

Temperature (°C)	Standard solution (0.718 mS/cm)	Standard solution (6.67 mS/cm)	Standard solution (58.6 mS/cm)
10	0.512	4.76	41.80
11	0.526	4.88	42.90
12	0.540	5.01	44.10
13	0.533	0.51	45.20
14	0.567	5.27	46.30
15	0.581	5.39	47.40
16	0.595	5.52	48.50
17	0.608	5.65	49.60
18	0.622	5.87	50.80
19	0.636	5.90	51.90
20	0.649	6.03	53.00
21	0.663	6.16	54.10
22	0.677	6.29	55.20
23	0.691	6.41	56.40
24	0.704	6.54	57.50
25	0.718	6.67	58.60
26	0.732	6.79	59.70
27	0.745	6.92	60.80
28	0.759	7.05	62.00
29	0.773	7.18	63.10
30	0.787	7.30	64.20
31	0.800	7.43	65.30

Table C: Change in Dissolved Oxygen with Temperature at 100% Relative Humidity (Altitude:sea level)

Temperature	DO (100% R.H.)
(Celsius)	(ppm, mg/L)
0.00	14.60
1.00	14.19
2.00	13.81
3.00	13.44
4.00	13.09
5.00	12.75
6.00	12.43
7.00	12.12
8.00	11.83
9.00	11.55
10.00	11.27
11.00	11.01
12.00	10.76
13.00	10.52
14.00	10.29
15.00	10.07
16.00	9.85
17.00	9.65
18.00	9.45
19.00	9.26
20.00	9.07
21.00	8.90
22.00	8.72
23.00	8.56
24.00	8.40
25.00	8.24
26.00	8.09
27.00	7.95
28.00	7.81
29.00	7.67
30.00	7.54
31.00	7.41
32.00	7.28

Values are for pressure = 760 mm Hg for measurements at sea level.
For a given temperature, the concentration of dissolved oxygen concentration decreases by 0.3 mg/L with every 500 ft (152.4 m) increase in altitude.

Multi-Parameter Water Quality Meter Calibration

pH Manual Calibration

Instrument: Horiba U-52G/10m
Control Unit Serial No: TH06G239
Sensor Probe Unit Serial No: 4KV0033X

Certificate of Calibration

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

Sensor	Solution	Temp. (°C)	Pre Calibration	Calibration Value	Post Calibration	Comment
pH	pH 4 standard solution phthalate	8.77	4.01	4.00	4.00	Pass
	pH 7 standard solution Neutral phosphate	8.49	7.43	7.06	7.06	Pass
	pH 10 standard solution Neutral phosphate	9.10	9.65	10.19	10.19	Pass

Calibrated by: **Jake Bourke**

Calibration date: **22/06/2023**

Table A: Change in pH with temperature (°C)

Temperature (°C)	pH 4 standard solution	pH 7 standard solution	pH 10 standard solution
5	4.00	7.09	10.24
10	4.00	7.06	10.19
15	4.00	7.04	10.12
20	4.00	7.02	10.06
30	4.01	7.00	9.96
35	4.02	6.99	9.92
40	4.03	6.97	9.90
50	4.06	6.95	9.82

Water Level Meter Calibration

Instrument: Solinst Water Level Meter (150m)
Serial No: 556202

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

Certificate of Calibration

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

Calibrated by: **Jake Bourke**

Calibration date: **7/05/2023**

Multi-Parameter Water Quality Meter Calibration

Instrument: Horiba U-52G/10m
Control Unit Serial No: WVM29BTT
Sensor Probe Unit Serial No: WSMJCJ88

Certificate of Calibration

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

Parameter	Units	Temp. (°C)	Pre Calibratio	Calibratio n Value	Post Calibratio	Comment
pH	pH	19.70	-	4.00	4.00	Pass
pH	pH	19.76	-	7.02	7.02	Pass
pH	pH	20.06	-	10.06	10.06	Pass
ORP	pH	-	-	240	240	Pass
Conductivity	mS/cm	-	-	0.00	0.00	Pass
Conductivity	mS/cm	19.74	-	0.649	0.649	Pass
Conductivity	mS/cm	19.94	-	6.03	6.03	Pass
Conductivity	mS/cm	19.83	-	53.00	53.00	Pass
D.O. Zero	mg/L	-	-	0.00	0.00	Pass
D.O. Span	mg/L	18.38	-	9.45	9.45	Pass

Calibrated by: **Matilda Englert**

Calibration date: **25/07/2023**

Table A: Change in pH with temperature (°C)

Temperature (°C)	pH 4 standard solution	pH 7 standard solution	pH 10 standard solution
5	4.00	7.09	10.24
10	4.00	7.06	10.19
15	4.00	7.04	10.12
20	4.00	7.02	10.06
30	4.01	7.00	9.96
35	4.02	6.99	9.92
40	4.03	6.97	9.90
50	4.06	6.95	9.82

Table B: Change in Conductivity with temperature (°C)

Temperature (°C)	Standard solution (0.718 mS/cm)	Standard solution (6.67 mS/cm)	Standard solution (58.6 mS/cm)
10	0.512	4.76	41.80
11	0.526	4.88	42.90
12	0.540	5.01	44.10
13	0.533	0.51	45.20
14	0.567	5.27	46.30
15	0.581	5.39	47.40
16	0.595	5.52	48.50
17	0.608	5.65	49.60
18	0.622	5.87	50.80
19	0.636	5.90	51.90
20	0.649	6.03	53.00
21	0.663	6.16	54.10
22	0.677	6.29	55.20
23	0.691	6.41	56.40
24	0.704	6.54	57.50
25	0.718	6.67	58.60
26	0.732	6.79	59.70
27	0.745	6.92	60.80
28	0.759	7.05	62.00
29	0.773	7.18	63.10
30	0.787	7.30	64.20
31	0.800	7.43	65.30

Table C: Change in Dissolved Oxygen with Temperature at 100% Relative Humidity (Altitude:sea level)

Temperature	DO (100% R.H.)
(Celsius)	(ppm, mg/L)
0.00	14.60
1.00	14.19
2.00	13.81
3.00	13.44
4.00	13.09
5.00	12.75
6.00	12.43
7.00	12.12
8.00	11.83
9.00	11.55
10.00	11.27
11.00	11.01
12.00	10.76
13.00	10.52
14.00	10.29
15.00	10.07
16.00	9.85
17.00	9.65
18.00	9.45
19.00	9.26
20.00	9.07
21.00	8.90
22.00	8.72
23.00	8.56
24.00	8.40
25.00	8.24
26.00	8.09
27.00	7.95
28.00	7.81
29.00	7.67
30.00	7.54
31.00	7.41
32.00	7.28

Values are for pressure = 760 mm Hg for measurements at sea level.
For a given temperature, the concentration of dissolved oxygen concentration decreases by 0.3 mg/L with every 500 ft (152.4 m) increase in altitude.

Multi-Parameter Water Quality Meter Calibration

pH Manual Calibration (two-points)

Instrument: Horiba U-52G/10m
Control Unit Serial No: WVM29BTT
Sensor Probe Unit Serial No: WSMJCJ88

Certificate of Calibration

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

Sensor	Solution	Temperature	Pre Calibration	Calibration Value	Post Calibration
pH	pH 4 standard solution phthalate	18.04	4.20	4.00	4.00
	pH 7 standard solution Neutral phosphate	17.76	8.17	7.02	7.02
	pH 10 standard solution Neutral phosphate	18.49	9.48	10.06	10.06

Calibrated by: **Jake Bourke**

Calibration date: **29/08/2023**

Table A: Change in pH with temperature (°C)

Temperature (°C)	pH 4 standard solution	pH 7 standard solution	pH 10 standard solution
5	4.00	7.09	10.24
10	4.00	7.06	10.19
15	4.00	7.04	10.12
20	4.00	7.02	10.06
30	4.01	7.00	9.96
35	4.02	6.99	9.92
40	4.03	6.97	9.90
50	4.06	6.95	9.82

Water Level Meter Calibration

Instrument: Solinst Water Level Meter (150m)
Serial No: 556202

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

Certificate of Calibration

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

Calibrated by: **Jake Bourke**

Calibration date: **7/05/2023**

Multi-Parameter Water Quality Meter Calibration

Instrument: Horiba U-52G/10m
Control Unit Serial No: TH06G239
Sensor Probe Unit Serial No: 4KV0033X

Certificate of Calibration

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

Parameter	Units	Temp. (°C)	Pre Calibratio	Calibratio n Value	Post Calibratio	Comment
pH	pH	18.25	4.22	4.00	4.00	Pass
pH	pH	21.19	6.97	7.02	7.02	Pass
pH	pH	21.26	10.10	10.06	10.06	Pass
ORP	mV	-	241.00	240	240.00	Pass
Conductivity	mS/cm	-	0.00	0.00	0.00	Pass
Conductivity	mS/cm	20.93	0.78	0.663	0.66	Pass
Conductivity	mS/cm	21.33	9.70	6.16	6.16	Pass
Conductivity	mS/cm	21.44	68.10	54.10	54.10	Pass
Turbidity	NTU	-	2.70	0	0.00	Pass
Turbidity	NTU	-	22.40	8	8.00	Pass
Turbidity	NTU	-	70.20	80	80.00	Pass
Turbidity	NTU	-	68.20	400	400.00	Pass
D.O. Zero	mg/L	-	0.00	0.00	0.00	Pass
D.O. Span	mg/L	19.51	9.95	9.07	9.07	Pass

Calibrated by: **Matilda Englert**

Calibration date: **18/10/2023**

Table A: Change in pH with temperature (°C)

Temperature (°C)	pH 4 standard solution	pH 7 standard solution	pH 10 standard solution
5	4.00	7.09	10.24
10	4.00	7.06	10.19
15	4.00	7.04	10.12
20	4.00	7.02	10.06
30	4.01	7.00	9.96
35	4.02	6.99	9.92
40	4.03	6.97	9.90
50	4.06	6.95	9.82

Table B: Change in Conductivity with temperature (°C)

Temperature (°C)	Standard solution (0.718 mS/cm)	Standard solution (6.67 mS/cm)	Standard solution (58.6 mS/cm)
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11	0.526	4.88	42.90
12	0.540	5.01	44.10
13	0.533	0.51	45.20
14	0.567	5.27	46.30
15	0.581	5.39	47.40
16	0.595	5.52	48.50
17	0.608	5.65	49.60
18	0.622	5.87	50.80
19	0.636	5.90	51.90
20	0.649	6.03	53.00
21	0.663	6.16	54.10
22	0.677	6.29	55.20
23	0.691	6.41	56.40
24	0.704	6.54	57.50
25	0.718	6.67	58.60
26	0.732	6.79	59.70
27	0.745	6.92	60.80
28	0.759	7.05	62.00
29	0.773	7.18	63.10
30	0.787	7.30	64.20
31	0.800	7.43	65.30

Table C: Change in Dissolved Oxygen with Temperature at 100% Relative Humidity (Altitude:sea level)

Temperature	DO (100% R.H.)
(Celsius)	(ppm, mg/L)
0.00	14.60
1.00	14.19
2.00	13.81
3.00	13.44
4.00	13.09
5.00	12.75
6.00	12.43
7.00	12.12
8.00	11.83
9.00	11.55
10.00	11.27
11.00	11.01
12.00	10.76
13.00	10.52
14.00	10.29
15.00	10.07
16.00	9.85
17.00	9.65
18.00	9.45
19.00	9.26
20.00	9.07
21.00	8.90
22.00	8.72
23.00	8.56
24.00	8.40
25.00	8.24
26.00	8.09
27.00	7.95
28.00	7.81
29.00	7.67
30.00	7.54
31.00	7.41
32.00	7.28

Values are for pressure = 760 mm Hg for measurements at sea level.
For a given temperature, the concentration of dissolved oxygen concentration decreases by 0.3 mg/L with every 500 ft (152.4 m) increase in altitude.

APPENDIX 7
HISTORICAL GROUNDWATER CONTOURS

Groundwater Contours - Shallow Aquifer 2013-2021

Shallow Aquifer July 2013

Shallow Aquifer November 2013

Shallow Aquifer February 2014

Shallow Aquifer June 2014

Shallow Aquifer November 2014

Shallow Aquifer February 2015

Shallow Aquifer June 2015

Shallow Aquifer September 2015

Shallow Aquifer December 2015

Shallow Aquifer April 2016

Shallow Aquifer July 2016

Shallow Aquifer October 2016

Shallow Aquifer December 2016

Shallow Aquifer March 2017

Shallow Aquifer June 2017

Shallow Aquifer September 2017

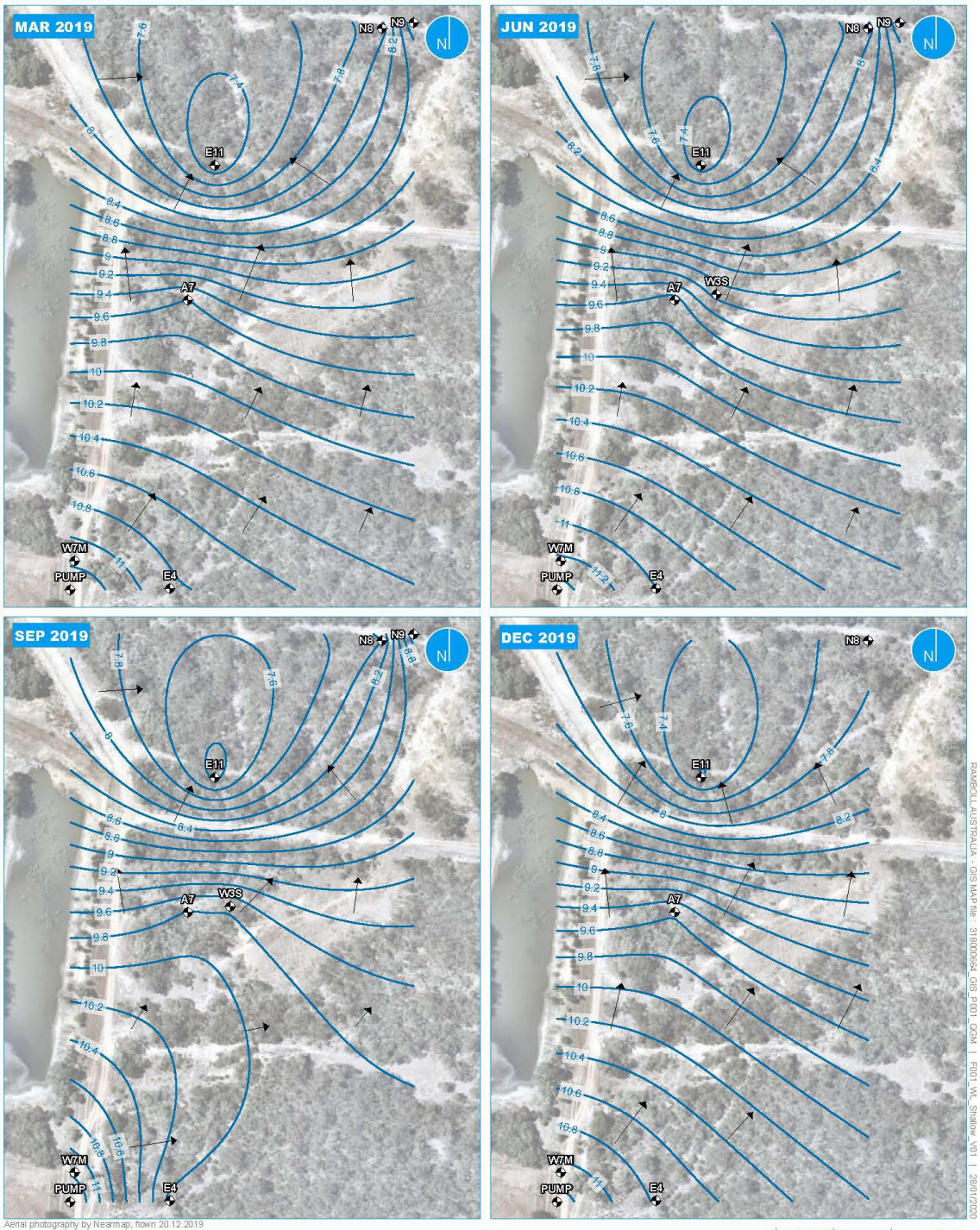
Shallow Aquifer December 2017

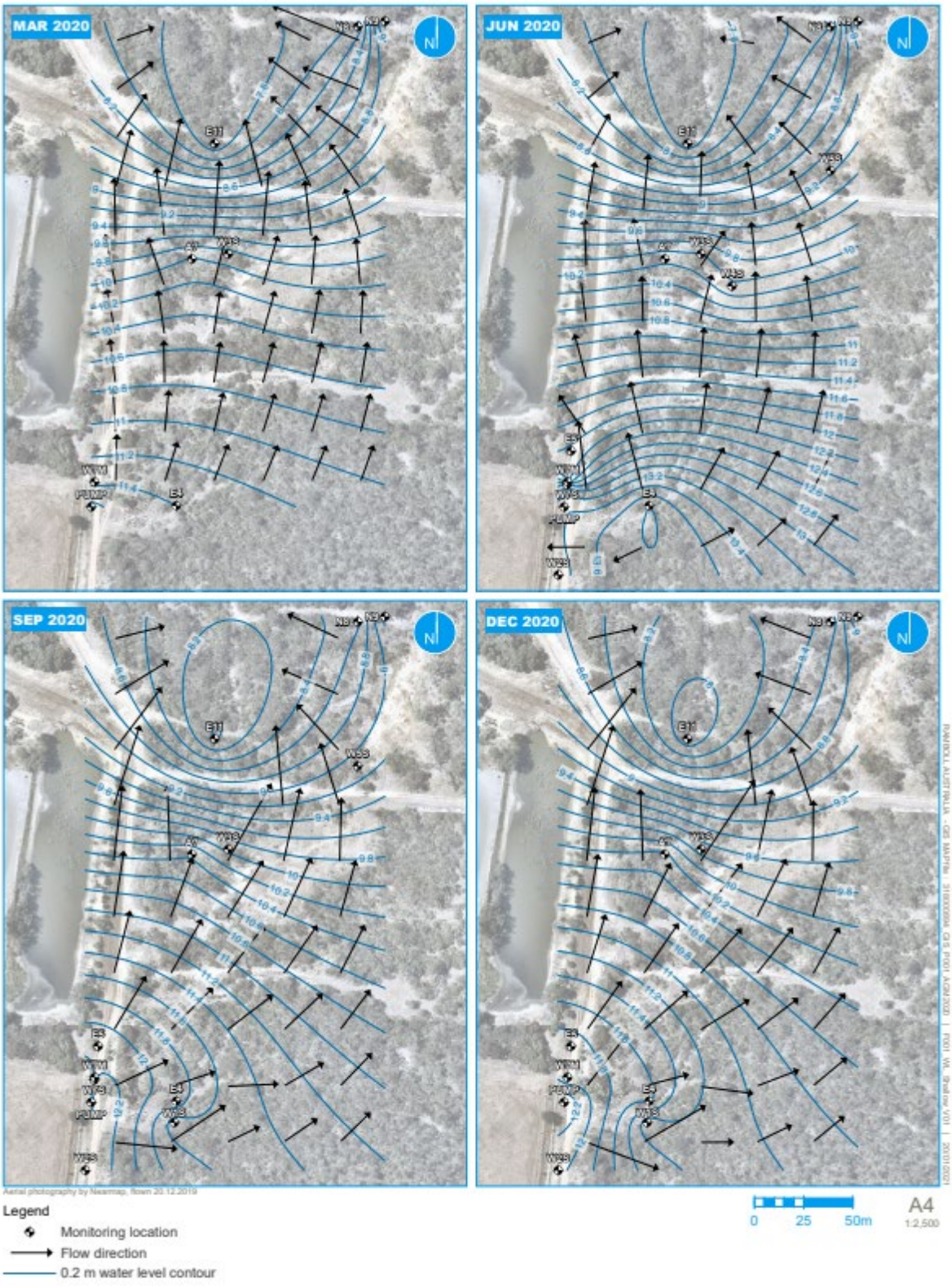
Shallow Aquifer March 2018

Shallow Aquifer June 2018

Shallow Aquifer September 2018

Shallow Aquifer December 2018


MAR 2019
JUN 2019
SEP 2019
DEC 2019
N8
N9
E11
A7
W3S
W7M
PUMP
E4
N
Aerial photography by Nearmap, flown 20.12.2019
Legend
Monitoring location
Flow direction
0.2 m water level contour
0
25
50m
A4
1:2,200
RAMBOLL AUSTRALIA - GIS MAP file - 318006624_GIS_P001_QGM | F001_WL_Shallow_V01 | 28/01/2020


MAR 2020
JUN 2020
SEP 2020
DEC 2020
N
E11
E4
WW1
WW3
WW4
WW5
WW6
WW8
WW9
PUMP
Aerial photography by Nearmap, flown 20.12.2019
Legend
Monitoring location
Flow direction
0.2 m water level contour
0
25
50m
A4
1:2,500


MAR 2021
JUN 2021
SEP 2021
DEC 2021
N
E1
E2
E3
E4
W1S
W2S
W3S
W4S
PUMP
Aerial photography by Nearmap, flown 20.12.2019
Legend
Monitoring location
Flow direction
0.2 m water level contour
0
25
50m
A4
1:2,500

Groundwater Contours – Deep Aquifer 2013-2021

Deep Aquifer February 2014

Deep Aquifer June 2014

Deep Aquifer November 2014

Deep Aquifer February 2015

Deep Aquifer June 2015

Deep Aquifer September 2015

Deep Aquifer December 2015

Deep Aquifer April 2016

Deep Aquifer July 2016

Deep Aquifer October 2016

Deep Aquifer December 2016

Deep Aquifer March 2017

Deep Aquifer June 2017

Deep Aquifer September 2017

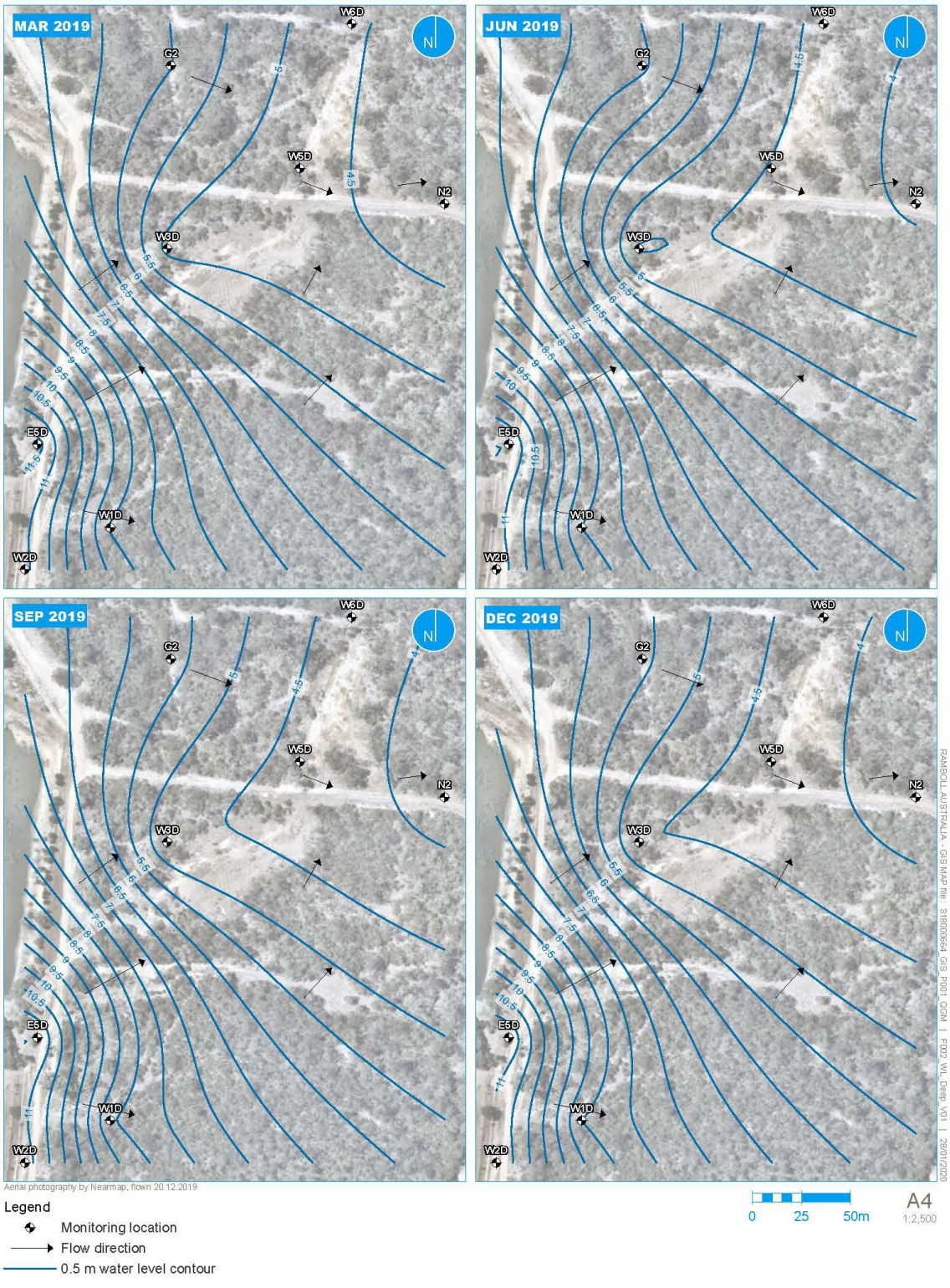
Deep Aquifer December 2017

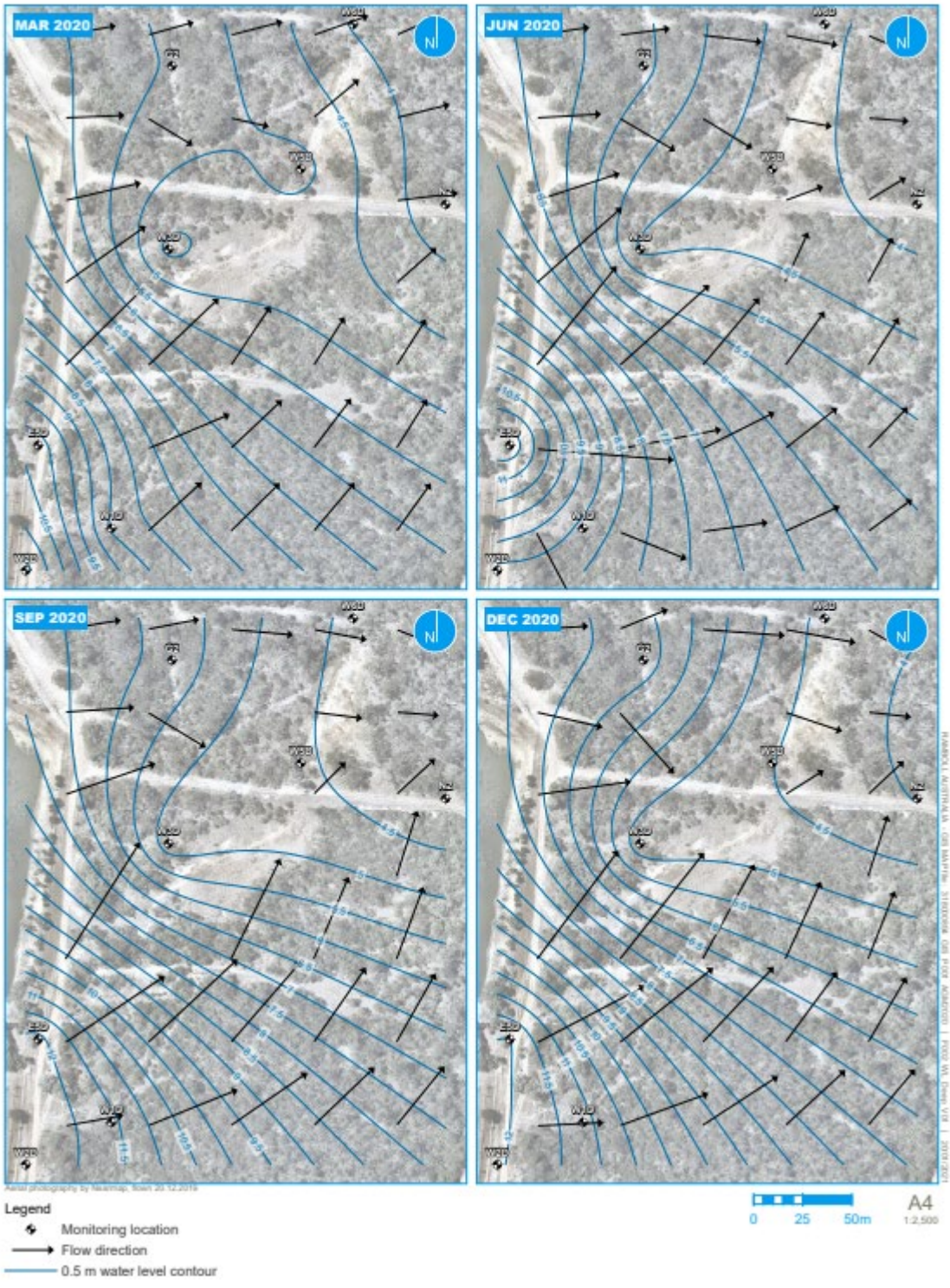

W6D
G2
W5D
N2
E3D
W1D


W6D
G2
W5D
N2
E3D
W1D


W6D
G2
W5D
N2
E3D
W1D
Deep Aquifer September 2018


W6D
G2
W5D
N2
E3D
W1D
Deep Aquifer December 2018


MAR 2019
JUN 2019
SEP 2019
DEC 2019
G2
W6D
W5D
N2
W3D
E5D
W1D
W2D
Aerial photography by Nearmap, flown 20.12.2019
Legend
Monitoring location
Flow direction
0.5 m water level contour
0
25
50m
A4
1:2,500
RAMBOLL AUSTRALIA - GIS MAP file: 318000644_GIS_F001_GIOM | F002_WL_Deep_V01 | 28/01/2020


MAR 2020
JUN 2020
SEP 2020
DEC 2020
Legend
Monitoring location
Flow direction
0.5 m water level contour
0
25
50m
A4
1:2,500


MAR 2021
JUN 2021
SEP 2021
DEC 2021
Aerial photography by Nearmap, flown 20.12.2019
Legend
Monitoring location
Flow direction
0.5 m water level contour
0 25 50m
A4
1:2,500

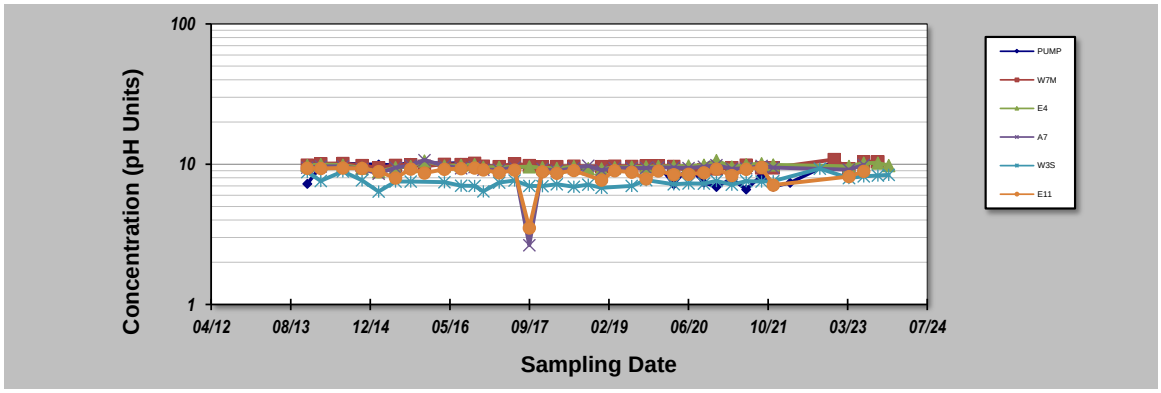

MAR 2022
JUN 2022
SEP 2022
DEC 2022
W6D
G2
W5D
N2
W3D
W4D
E5D
W1D
W2D
Aerial photography by Nearmap, flown 06.12.2022
Legend
Monitoring location
Monitoring location dry at time of sampling
0.5m water level contour
Flow direction
0
25
50m
A4
1:2,600

APPENDIX 8
MANN-KENDALL TREND ANALYSIS

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	19-Jan-24	Job ID:	318001662
Facility Name:	Hydro Kurri Kurri	Constituent:	pH
Conducted By:	Jake Bourke	Concentration Units:	pH Units

Sampling Point ID:	PUMP	W7M	E4	A7	W3S	E11	
Sampling Event	Sampling Date	PH CONCENTRATION (pH Units)						
1	26-Nov-13	7.24	9.87	9.79	9.47	8.82	9.36	
2	18-Feb-14	9.65	10.1	9.94	9.67	7.61	9.33	
3	7-Jul-14	10.14	10.12	9.84	9.66	8.89	9.41	
4	4-Nov-14	10.01	9.78	9.4	9.24	7.68	9.32	
5	17-Feb-15	9.95	9.44	8.84	8.56	6.38	8.86	
6	3-Jun-15	9.87	9.82	9.46	9.45	7.53	7.97	
7	7-Sep-15	10.22	9.91	9.62	9.8	7.53	9.23	
8	2-Dec-15	10.27	9.7	10.57	10.71		8.65	
9	5-Apr-16	10.13	9.99	9.73	9.75	7.46	9.2	
10	19-Jul-16	10.22	9.95	9.83	9.37	7.02	9.29	
11	12-Oct-16	9.98	10.17	9.94	9.57	7.01	9.41	
12	6-Dec-16	9.72	9.68	9.53	9.15	6.4	9.1	
13	15-Mar-17	9.56	9.61	9.53	9.12	7.4	8.7	
14	20-Jun-17	9.2	10.1		9.49	7.66	9.07	
15	21-Sep-17	9.9	9.8	9.59	2.65	7	3.51	
16	12-Dec-17	9.6	9.6	9.46	9.27	6.99	8.83	
17	13-Mar-18	9.73	9.61	9.32	8.96	7.19	8.62	
18	28-Jun-18	9.17	9.7	9.62	9.36	6.91	9.02	
19	26-Sep-18			9.29	9.75	7.14		
20	19-Dec-18	9.55	9.63	9.27	9.06	6.8	7.7	
21	11-Mar-19	9.42	9.68	9.47	9.38		8.99	
22	26-Jun-19	9.43	9.65	9.56	9.4	7.01	8.76	
23	24-Sep-19	9.89	9.73	9.58	9.39	7.7	7.87	
24	11-Dec-19	9.93	9.75	9.67	9.48		8.95	
25	17-Mar-20	7.2	9.67	9.65	9.46	7.21	8.41	
26	17-Jun-20	9.59	8.97	9.73	9.4	7.29	8.48	
27	22-Sep-20	7.4	9.1	9.87	9.6	7.28	8.69	
28	9-Dec-20	6.88	9.28	10.64	9.85	7.59	9.24	
29	17-Mar-21	7.9	9.47	9.56	9.26	7.14	8.3	
30	15-Jun-21	6.61	9.86	9.91	9.36	7.57	9.21	
31	20-Sep-21	8.32	9.42	10.1	9.73	7.53	9.48	
32	1-Dec-21	6.91	9.44	9.89	9.46	7.58	7.09	
33	17-Mar-22	7.37	9.29	9.82	9.5	8.21	6.88	
34	15-Jun-22	9.56	10.39	10.28	9.78	8.96	7.37	
35	20-Sep-22	9.78	10.16	10.45	9.98	9.3	6.91	
36	20-Dec-22	10.45	10.81	10.7	10.2	8.3	8.8	
37	23-Mar-23		9.3	9.65	9.15	7.97	8.16	
38	23-Jun-23		10.4	10.2	9.9	8.2	8.9	
39	21-Sep-23		10.4	10.2		8.3		
40	28-Nov-23			9.8		8.4		
Coefficient of Variation:		0.13	0.04	0.04	0.13	0.09	0.12	
Mann-Kendall Statistic (S):		-158	-51	245	134	177	-41	
Confidence Factor:		99.3%	76.0%	>99.9%	97.6%	99.6%	73.1%	
Concentration Trend:		Decreasing	Stable	Increasing	Increasing	Increasing	Stable	



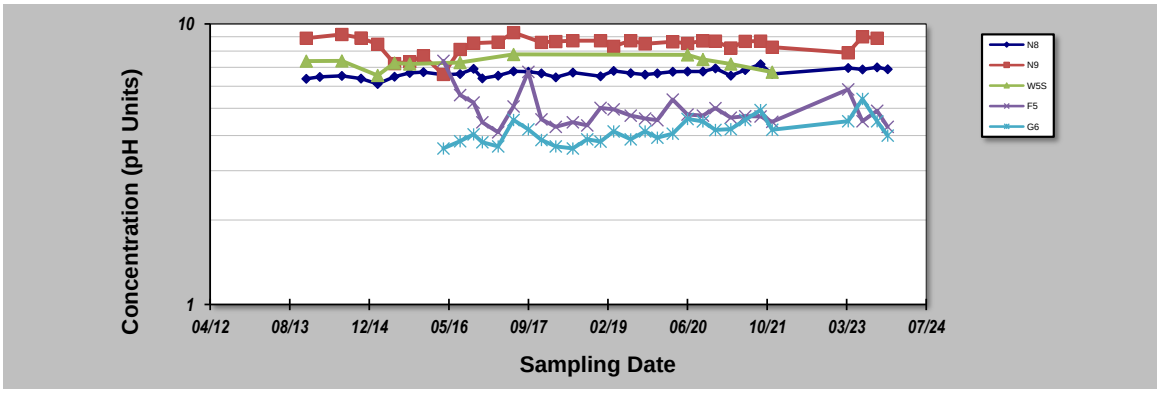
Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	19-Jan-24	Job ID:	318001662
Facility Name:	Hydro Kurri Kurri	Constituent:	pH
Conducted By:	Jake Bourke	Concentration Units:	pH Units

Sampling Point ID:	N8	N9	W5S	F5	G6		
Sampling Event	Sampling Date	PH CONCENTRATION (pH Units)						
1	26-Nov-13	6.38	8.9	7.37				
2	18-Feb-14	6.48						
3	7-Jul-14	6.53	9.17	7.39				
4	4-Nov-14	6.39	8.91					
5	17-Feb-15	6.11	8.46	6.55				
6	3-Jun-15	6.49	7.22	7.26				
7	7-Sep-15	6.69	7.34	7.2				
8	2-Dec-15	6.74	7.7					
9	5-Apr-16	6.59	6.61		7.38	3.6		
10	19-Jul-16	6.63	8.11	7.29	5.58	3.82		
11	12-Oct-16	6.92	8.54		5.25	4.04		
12	6-Dec-16	6.4			4.46	3.79		
13	15-Mar-17	6.54	8.61		4.11	3.66		
14	20-Jun-17	6.78	9.32	7.79	5.08	4.55		
15	21-Sep-17	6.76			6.75	4.21		
16	12-Dec-17	6.67	8.6		4.57	3.86		
17	13-Mar-18	6.45	8.65		4.3	3.66		
18	28-Jun-18	6.71	8.72		4.46	3.6		
19	26-Sep-18				4.35	3.88		
20	19-Dec-18	6.51	8.72		5.02	3.81		
21	11-Mar-19	6.81	8.33		4.96	4.14		
22	26-Jun-19	6.68	8.71		4.71	3.88		
23	24-Sep-19	6.6	8.5		4.6	4.14		
24	11-Dec-19	6.67			4.54	3.93		
25	17-Mar-20	6.76	8.64		5.38	4.06		
26	17-Jun-20	6.77	8.53	7.76	4.75	4.59		
27	22-Sep-20	6.77	8.7	7.47	4.71	4.49		
28	9-Dec-20	6.95	8.69		5.01	4.19		
29	17-Mar-21	6.54	8.21	7.2	4.63	4.22		
30	15-Jun-21	6.85	8.67		4.69	4.55		
31	20-Sep-21	7.19	8.68		4.68	4.94		
32	1-Dec-21	6.63	8.27	6.74	4.48	4.2		
33	18-Mar-22	6.91	8.26		5.45	4.37		
34	16-Jun-22	7.11	8.86		5.37	4.29		
35	21-Sep-22	7.52	8.41		5.07	5.3		
36	21-Dec-22	7.54	7.81		4.74	4.1		
37	24-Mar-23	6.97	7.9		5.84	4.5		
38	22-Jun-23	6.89	9		4.5	5.4		
39	22-Sep-23	7	8.9		4.9	4.5		
40	27-Nov-23	6.9			4.3	4		
Coefficient of Variation:		0.03	0.07	0.05	0.15	0.10		
Mann-Kendall Statistic (S):		424	131	-2	21	268		
Confidence Factor:		>99.9%	99.0%	53.0%	65.2%	>99.9%		
Concentration Trend:		Increasing	Increasing	Stable	No Trend	Increasing		



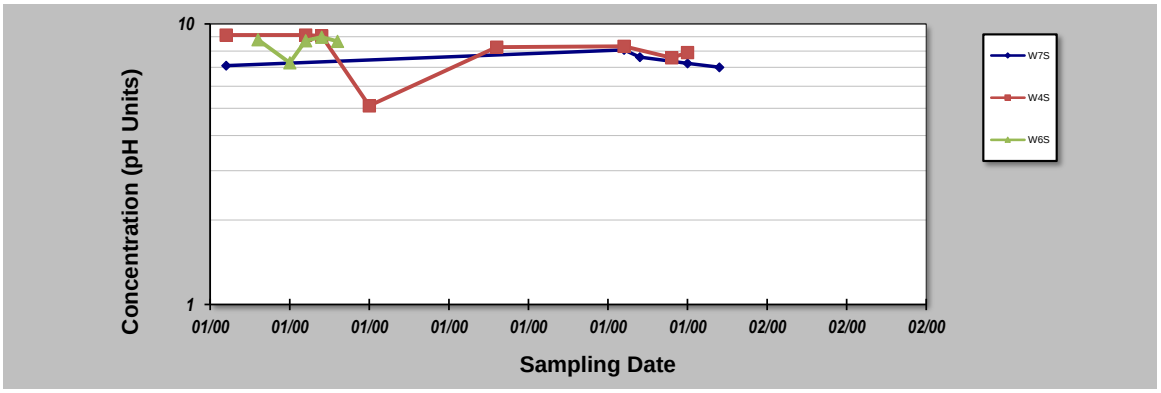
Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	19-Jan-24	Job ID:	318001662
Facility Name:	Hydro Kurri Kurri	Constituent:	pH
Conducted By:	Jake Bourke	Concentration Units:	pH Units

Sampling Point ID:	W1S	W2S	E5	W7S	W4S	W6S	
Sampling Event	Sampling Date	PH CONCENTRATION (pH Units)						
1	26-Nov-13	7.17	6.82	9.37	7.1	9.13		
2	18-Feb-14	6.84		9.78				
3	7-Jul-14	6.9					8.79	
4	4-Nov-14							
5	17-Feb-15	6.66					7.27	
6	3-Jun-15	6.83		9.14		9.13	8.72	
7	7-Sep-15	6.86		9.42		9.07	8.98	
8	2-Dec-15						8.67	
9	5-Apr-16	7.21		9.48				
10	19-Jul-16					5.11		
11	12-Oct-16							
12	6-Dec-16							
13	15-Mar-17							
14	20-Jun-17							
15	21-Sep-17							
16	12-Dec-17							
17	13-Mar-18							
18	28-Jun-18					8.26		
19	26-Sep-18							
20	19-Dec-18		7.47					
21	11-Mar-19							
22	26-Jun-19							
23	24-Sep-19							
24	11-Dec-19							
25	17-Mar-20							
26	17-Jun-20			8.79	8.08	8.32		
27	22-Sep-20	7.89	6.73	9.11	7.61			
28	9-Dec-20	8.24	6.97	9.2				
29	17-Mar-21	7.55	7.19	8.89		7.58		
30	15-Jun-21	7.99	7.32	9.15	7.24	7.91		
31	20-Sep-21	8.11		9.36				
32	1-Dec-21	7.61	6.89	9.16	7.01			
33	17-Mar-22	7.48	6.51	9.27	6.95			
34	15-Jun-22	8.6	6.77	9.63	7.38			
35	20-Sep-22	8.1	7.02	9.84	7.13		8.56	
36	20-Dec-22	7.98	7.17	10.19				
37	23-Mar-23	7.45	8.49	9.28				
38	22-Jun-23	8						
39	21-Sep-23							
40	28-Nov-23							
Coefficient of Variation:		0.07	0.08	0.03	0.06	0.16	0.08	
Mann-Kendall Statistic (S):		97	40	32	12	-15	5	
Confidence Factor:		>99.9%	100.0%	97.1%	100.0%	95.8%	82.1%	
Concentration Trend:		Increasing	Increasing	Increasing	Increasing	Decreasing	No Trend	



Notes:

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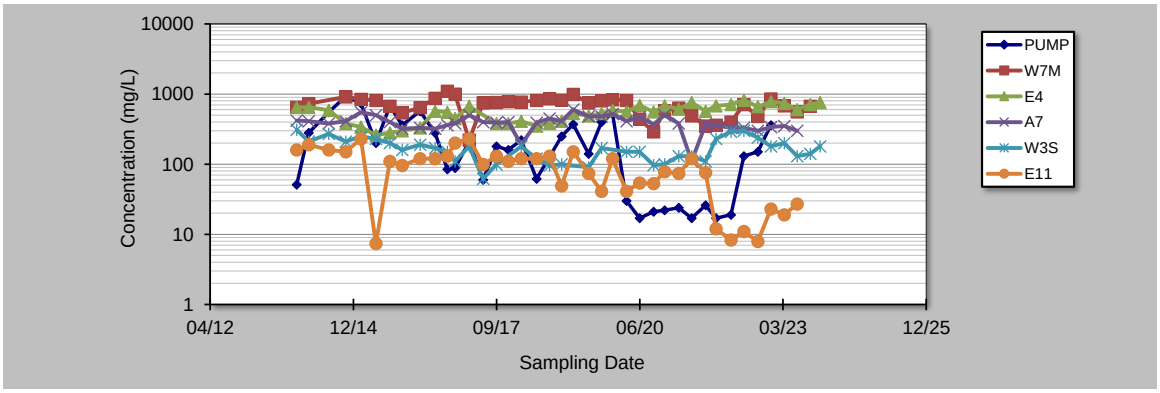
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	19-Jan-24	Job ID:	318001662
Facility Name:	Hydro Kurri Kurri	Constituent:	Soluble Fluoride
Conducted By:	Jake Bourke	Concentration Units:	mg/L

Sampling Point ID:	PUMP	W7M	E4	A7	W3S	E11	
Sampling Event	Sampling Date	SOLUBLE FLUORIDE CONCENTRATION (mg/L)						
1	26-Nov-13	51	650	650	420	310	160	
2	18-Feb-14	280	730	650	410	210	190	
3	7-Jul-14	550		590	380	270	160	
4	4-Nov-14	930	910	380	410	210	150	
5	17-Feb-15	740	840	340	550	250	230	
6	3-Jun-15	200	810	260	500	230	7.4	
7	7-Sep-15	680	670	280	400	200	110	
8	2-Dec-15	360	540	300	320	160	96	
9	5-Apr-16	570	640	330	330	190	120	
10	19-Jul-16	280	870	570	320	170	120	
11	12-Oct-16	85	1100	550	360	150	130	
12	6-Dec-16	88	1000	450	380	110	200	
13	15-Mar-17	210	220	670	500	180	230	
14	20-Jun-17	60	750		400	62	99	
15	21-Sep-17	180	760	380	390	99	130	
16	12-Dec-17	160	780	380	400		110	
17	13-Mar-18	220	770	410	190	180	120	
18	28-Jun-18	62	810	350	390	120	120	
19	26-Sep-18		860	380	450	96	130	
20	19-Dec-18	250	820	410	410	100	49	
21	11-Mar-19	370	990	530	600		150	
22	26-Jun-19	140	750	490	480	90	74	
23	24-Sep-19	400	800	530	480	170	41	
24	11-Dec-19	530	830	590	520		120	
25	17-Mar-20	30	810	560	410	150	41	
26	17-Jun-20	17	440	690	470	150	54	
27	22-Sep-20	21	290	560	370	97	53	
28	8-Dec-20	22	580	680	500	100	78	
29	17-Mar-21	24	630	610	380	130	74	
30	15-Jun-21	17	490	760	110	130	120	
31	20-Sep-21	26	350	570	370	110	76	
32	1-Dec-21	17	360	680	360	230	12	
33	17-Mar-22	19	400	710	330	290	8.3	
34	15-Jun-22	130	710	820	330	300	11	
35	20-Sep-22	150	480	660	300	240	7.9	
36	20-Dec-22	360	850	780	340	180	23	
37	24-Mar-23		680	740	350	200	19	
38	22-Jun-23		560	600	300	130	27	
39	21-Sep-23		670	710		140		
40	28-Nov-23			760		180		
Coefficient of Variation:		1.01	0.29	0.29	0.23	0.37	0.65	
Mann-Kendall Statistic (S):		-228	-166	384	-161	-104	-361	
Confidence Factor:		100.0%	98.2%	>99.9%	97.8%	91.0%	>99.9%	
Concentration Trend:		Decreasing	Decreasing	Increasing	Decreasing	Prob. Decreasing	Decreasing	



Notes:

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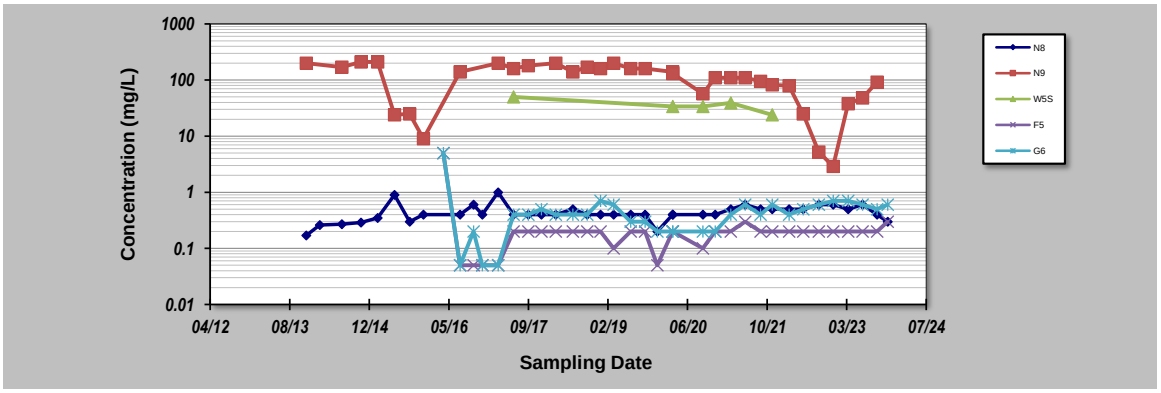
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	19-Jan-24	Job ID:	318001662
Facility Name:	Hydro Kurri Kurri	Constituent:	Soluble Fluoride
Conducted By:	Jake Bourke	Concentration Units:	mg/L

Sampling Point ID:	N8	N9	W5S	F5	G6		
Sampling Event	Sampling Date	SOLUBLE FLUORIDE CONCENTRATION (mg/L)						
1	26-Nov-13	0.17	200					
2	18-Feb-14	0.26						
3	7-Jul-14	0.27	170					
4	4-Nov-14	0.29	210					
5	17-Feb-15	0.35	210					
6	3-Jun-15	0.9	24					
7	7-Sep-15	0.3	25					
8	2-Dec-15	0.4	9					
9	5-Apr-16				5	5		
10	19-Jul-16	0.4	140		0.05	0.05		
11	12-Oct-16	0.6			0.05	0.2		
12	6-Dec-16	0.4			0.05	0.05		
13	15-Mar-17	1	200		0.05	0.05		
14	20-Jun-17	0.4	160	50	0.2	0.4		
15	21-Sep-17	0.4	180		0.2	0.4		
16	12-Dec-17	0.4			0.2	0.5		
17	13-Mar-18	0.4	200		0.2	0.4		
18	28-Jun-18	0.5	140		0.2	0.4		
19	26-Sep-18	0.4	170		0.2	0.4		
20	19-Dec-18	0.4	160		0.2	0.7		
21	11-Mar-19	0.4	200		0.1	0.6		
22	26-Jun-19	0.4	160		0.2	0.3		
23	24-Sep-19	0.4	160		0.2	0.3		
24	11-Dec-19	0.2			0.05	0.2		
25	17-Mar-20	0.4	140		0.2	0.2		
26	17-Mar-20	0.4	130	34	0.2	0.2		
27	22-Sep-20	0.4	57	34	0.1	0.2		
28	8-Dec-20	0.4	110		0.2	0.2		
29	17-Mar-21	0.5	110	39	0.2	0.4		
30	15-Jun-21	0.6	110		0.3	0.6		
31	20-Sep-21	0.5	95		0.2	0.4		
32	1-Dec-21	0.5	82	24	0.2	0.6		
33	17-Mar-22	0.5	79		0.2	0.4		
34	15-Jun-22	0.5	25		0.2	0.5		
35	20-Sep-22	0.6	5.2		0.2	0.6		
36	20-Dec-22	0.6	2.9		0.2	0.7		
37	24-Mar-23	0.5	38		0.2	0.7		
38	22-Jun-23	0.6	48		0.2	0.6		
39	22-Sep-23	0.4	92		0.2	0.5		
40	27-Nov-23	0.3			0.3	0.6		
Coefficient of Variation:		0.36	0.58	0.26	2.62	1.54		
Mann-Kendall Statistic (S):		257	-261	-5	117	156		
Confidence Factor:		99.9%	>99.9%	82.1%	97.0%	99.4%		
Concentration Trend:		Increasing	Decreasing	Stable	Increasing	Increasing		



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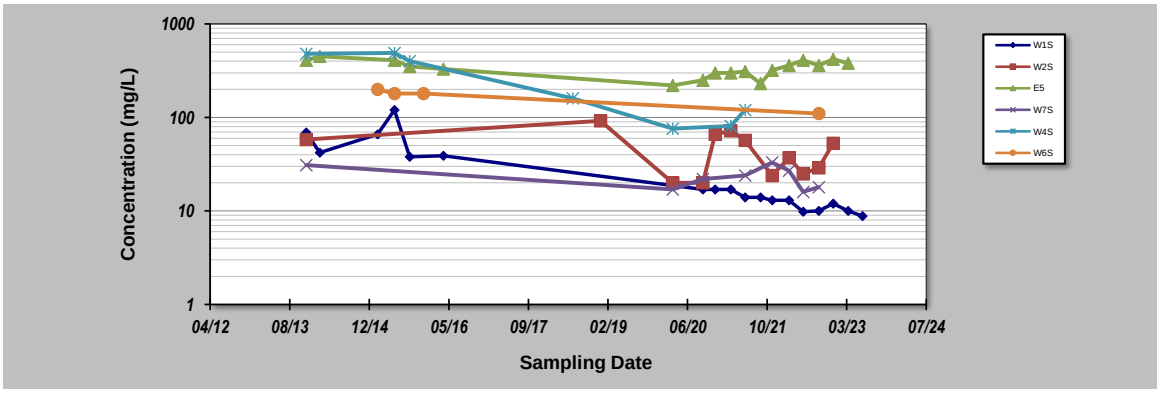
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 19-Jan-24
Facility Name: Hydro Kurri Kurri
Conducted By: Jake Bourke
Job ID: 318001662
Constituent: Soluble Fluoride
Concentration Units: mg/L

Sampling Point ID:	W1S	W2S	E5	W7S	W4S	W6S	
Sampling Event	Sampling Date	SOLUBLE FLUORIDE CONCENTRATION (mg/L)						
1	26-Nov-13	69	58	410	31	480		
2	18-Feb-14	42		450				
3	7-Jul-14							
4	4-Nov-14							
5	17-Feb-15	66					200	
6	3-Jun-15	120		410		490	180	
7	7-Sep-15	38		350		400		
8	2-Dec-15						180	
9	5-Apr-16	39		330				
10	19-Jul-16							
11	12-Oct-16							
12	6-Dec-16							
13	15-Mar-17							
14	20-Jun-17							
15	21-Sep-17							
16	12-Dec-17							
17	13-Mar-18							
18	28-Jun-18					160		
19	26-Sep-18							
20	19-Dec-18		92					
21	11-Mar-19							
22	26-Jun-19							
23	24-Sep-19							
24	11-Dec-19							
25	17-Mar-20							
26	17-Mar-20		20	220	17	76		
27	22-Sep-20	17	20	250	22			
28	8-Dec-20	17	66	300				
29	17-Mar-21	17	72	300		81		
30	15-Jun-21	14	57	310	24	120		
31	20-Sep-21	14		230				
32	1-Dec-21	13	24	320	33			
33	17-Mar-22	13	37	360	27			
34	15-Jun-22	9.8	25	410	16			
35	20-Sep-22	10	29	360	18		110	
36	20-Dec-22	12	53	420				
37	24-Mar-23	10		380				
38	22-Jun-23	8.8						
39	22-Sep-23							
40	27-Nov-23							
Coefficient of Variation:		1.00	0.51	0.20	0.27	0.74	0.24	
Mann-Kendall Statistic (S):		-129	-9	9	-4	-13	-5	
Confidence Factor:		>99.9%	70.4%	62.7%	64.0%	96.5%	89.6%	
Concentration Trend:		Decreasing	Stable	No Trend	Stable	Decreasing	Stable	



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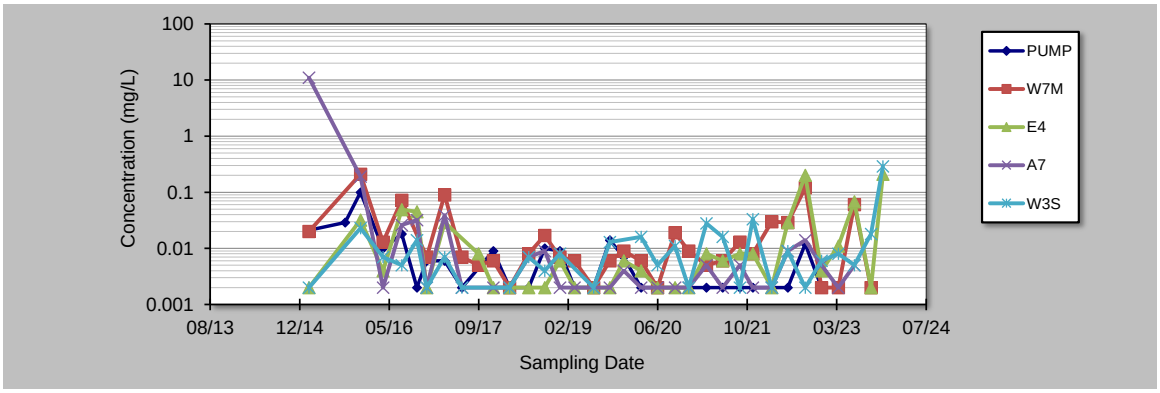
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	19-Jan-24	Job ID:	318001662
Facility Name:	Hydro Kurri Kurri	Constituent:	Free Cyanide
Conducted By:	Jake Bourke	Concentration Units:	mg/L

Sampling Point ID:	PUMP	W7M	E4	A7	W3S		
Sampling Event	Sampling Date	FREE CYANIDE CONCENTRATION (mg/L)						
1	17-Feb-15	0.021	0.02	0.002	11	0.002		
2	3-Jun-15							
3	7-Sep-15	0.029						
4	2-Dec-15	0.1	0.21	0.032	0.19	0.023		
5	5-Apr-16	0.01	0.013	0.004	0.002	0.007		
6	19-Jul-16	0.018	0.072	0.049	0.026	0.005		
7	12-Oct-16	0.002		0.045	0.032	0.014		
8	6-Dec-16	0.006	0.007	0.002	0.002	0.002		
9	15-Mar-17	0.006	0.09	0.029	0.039	0.007		
10	20-Jun-17	0.002	0.007		0.002	0.002		
11	21-Sep-17		0.005	0.008				
12	12-Dec-17	0.009	0.006	0.002	0.002			
13	13-Mar-18	0.002	0.002	0.002	0.002	0.002		
14	28-Jun-18	0.002	0.008	0.002	0.007	0.007		
15	26-Sep-18	0.01	0.017	0.002	0.009	0.004		
16	19-Dec-18	0.009	0.007	0.006	0.002	0.008		
17	11-Mar-19	0.002	0.006	0.002	0.002			
18	26-Jun-19	0.002	0.002	0.002	0.002	0.002		
19	24-Sep-19	0.014	0.006	0.002	0.002	0.013		
20	11-Dec-19	0.007	0.009	0.006	0.004			
21	17-Mar-20	0.002	0.006	0.004	0.002	0.016		
22	17-Jun-20	0.002	0.002	0.002	0.002	0.005		
23	22-Sep-20	0.002	0.019	0.002	0.002	0.011		
24	8-Dec-20	0.002	0.009	0.002	0.002	0.002		
25	17-Mar-21	0.002	0.005	0.008	0.005	0.028		
26	15-Jun-21	0.002	0.006	0.006	0.002	0.016		
27	20-Sep-21	0.002	0.013	0.008	0.005	0.002		
28	1-Dec-21	0.002	0.008	0.008	0.002	0.033		
29	17-Mar-22	0.002	0.03	0.002	0.002	0.002		
30	15-Jun-22	0.002	0.029	0.029	0.009	0.009		
31	20-Sep-22	0.012	0.12	0.2	0.014	0.002		
32	20-Dec-22	0.002	0.002	0.004	0.005	0.006		
33	24-Mar-23		0.002	0.011	0.002	0.008		
34	22-Jun-23		0.06	0.068	0.005	0.005		
35	22-Sep-23		0.002	0.002		0.018		
36	28-Nov-23			0.21		0.29		
37								
38								
39								
40								
Coefficient of Variation:		1.93	1.75	2.15	5.37	2.83		
Mann-Kendall Statistic (S):		-164	-62	76	-56	71		
Confidence Factor:		99.9%	83.7%	87.6%	82.4%	89.3%		
Concentration Trend:		Decreasing	No Trend	No Trend	No Trend	No Trend		



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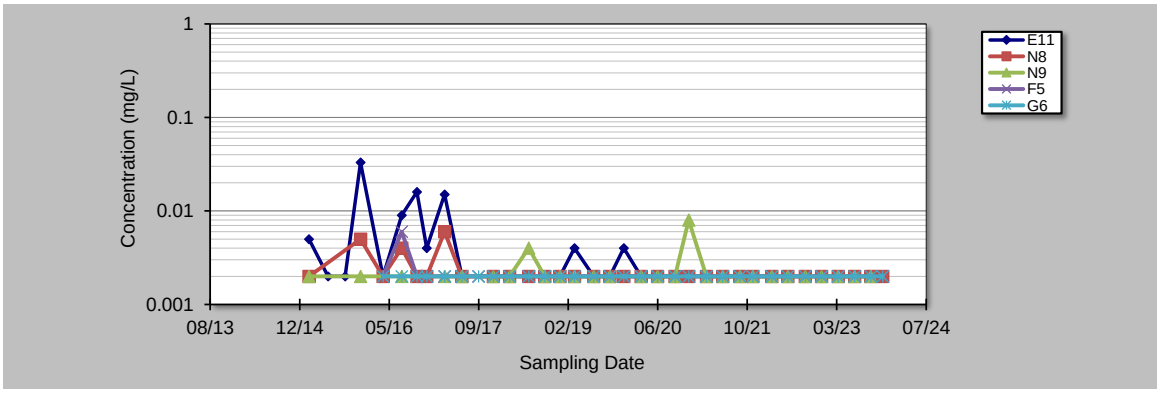
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	19-Jan-24	Job ID:	318001662
Facility Name:	Hydro Kurri Kurri	Constituent:	Free Cyanide
Conducted By:	Jake Bourke	Concentration Units:	mg/L

Sampling Point ID:	E11	N8	N9	F5	G6		
Sampling Event	Sampling Date	FREE CYANIDE CONCENTRATION (mg/L)						
1	17-Feb-15	0.005	0.002	0.002				
2	3-Jun-15	0.002						
3	7-Sep-15	0.002						
4	2-Dec-15	0.033	0.005	0.002				
5	5-Apr-16	0.002	0.002		0.002	0.002		
6	19-Jul-16	0.009	0.004	0.002	0.006	0.002		
7	12-Oct-16	0.016	0.002		0.002	0.002		
8	6-Dec-16	0.004	0.002		0.002	0.002		
9	15-Mar-17	0.015	0.006	0.002	0.002	0.002		
10	20-Jun-17	0.002	0.002	0.002	0.002	0.002		
11	21-Sep-17				0.002	0.002		
12	12-Dec-17	0.002	0.002	0.002	0.002	0.002		
13	13-Mar-18	0.002	0.002	0.002	0.002	0.002		
14	28-Jun-18	0.002	0.002	0.004	0.002	0.002		
15	26-Sep-18	0.002	0.002	0.002	0.002	0.002		
16	19-Dec-18	0.002	0.002	0.002	0.002	0.002		
17	11-Mar-19	0.004	0.002	0.002	0.002	0.002		
18	26-Jun-19	0.002	0.002	0.002	0.002	0.002		
19	24-Sep-19	0.002	0.002	0.002	0.002	0.002		
20	11-Dec-19	0.004	0.002		0.002	0.002		
21	17-Mar-20	0.002	0.002	0.002	0.002	0.002		
22	17-Jun-20	0.002	0.002	0.002	0.002	0.002		
23	22-Sep-20	0.002	0.002	0.002	0.002	0.002		
24	8-Dec-20	0.002	0.002	0.008	0.002	0.002		
25	17-Mar-21	0.002	0.002	0.002	0.002	0.002		
26	15-Jun-21	0.002	0.002	0.002	0.002	0.002		
27	20-Sep-21	0.002	0.002	0.002	0.002	0.002		
28	1-Dec-21	0.002	0.002	0.002	0.002	0.002		
29	17-Mar-22	0.002	0.002	0.002	0.002	0.002		
30	15-Jun-22	0.002	0.002	0.002	0.002	0.002		
31	20-Sep-22	0.002	0.002	0.002	0.002	0.002		
32	20-Dec-22	0.002	0.002	0.002	0.002	0.002		
33	23-Mar-23	0.002	0.002	0.002	0.002	0.002		
34	23-Jun-23	0.002	0.002	0.002	0.002	0.002		
35	21-Sep-23		0.002	0.002	0.002	0.002		
36	27-Nov-23		0.002		0.002	0.002		
37								
38								
39								
40								
Coefficient of Variation:		1.46	0.40	0.52	0.33	0.00		
Mann-Kendall Statistic (S):		-143	-75	-7	-29	0		
Confidence Factor:		98.7%	87.3%	54.7%	67.4%	49.4%		
Concentration Trend:		Decreasing	Stable	Stable	Stable	Stable		



Notes:

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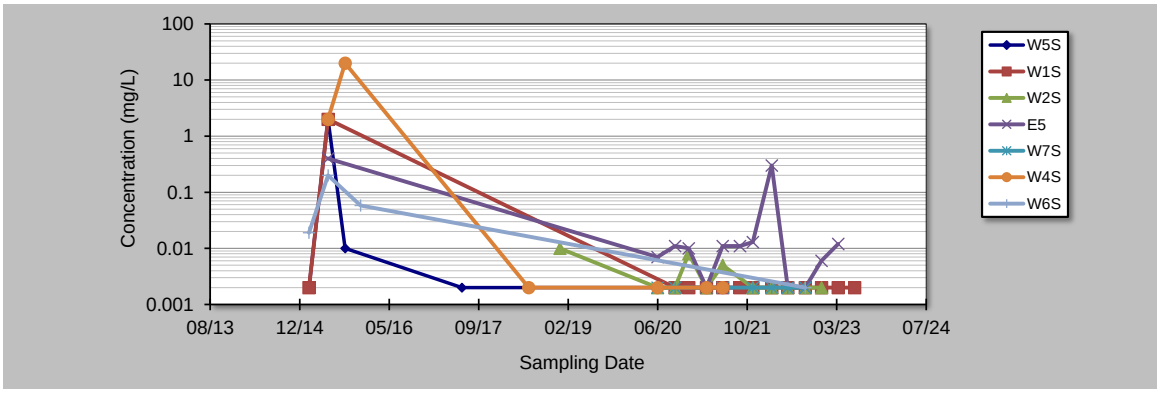
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	19-Jan-24	Job ID:	318001662
Facility Name:	Hydro Kurri Kurri	Constituent:	Free Cyanide
Conducted By:	Jake Bourke	Concentration Units:	mg/L

Sampling Point ID:	W5S	W1S	W2S	E5	W7S	W4S	W6S
Sampling Event	Sampling Date	FREE CYANIDE CONCENTRATION (mg/L)						
1	17-Feb-15	0.002	0.002					0.019
2	3-Jun-15	2	2		0.4		2	0.2
3	7-Sep-15	0.01					20	
4	2-Dec-15							0.058
5	5-Apr-16							
6	19-Jul-16							
7	12-Oct-16							
8	6-Dec-16							
9	15-Mar-17							
10	20-Jun-17	0.002						
11	21-Sep-17							
12	12-Dec-17							
13	13-Mar-18							
14	28-Jun-18						0.002	
15	26-Sep-18							
16	19-Dec-18			0.01				
17	11-Mar-19							
18	26-Jun-19							
19	24-Sep-19							
20	11-Dec-19							
21	17-Mar-20							
22	17-Jun-20	0.002		0.002	0.007	0.002	0.002	
23	22-Sep-20	0.002	0.002	0.002	0.011	0.002		
24	8-Dec-20		0.002	0.008	0.01			
25	17-Mar-21	0.002	0.002	0.002	0.002		0.002	
26	15-Jun-21		0.002	0.005	0.011	0.002	0.002	
27	20-Sep-21		0.002		0.011			
28	1-Dec-21	0.002	0.002	0.002	0.013	0.002		
29	17-Mar-22		0.002	0.002	0.3	0.002		
30	15-Jun-22		0.002	0.002	0.002	0.002		
31	20-Sep-22		0.002	0.002	0.002	0.002		0.002
32	20-Dec-22		0.002	0.002	0.006			
33	23-Mar-23		0.002		0.012			
34	23-Jun-23		0.002					
35	21-Sep-23							
36	27-Nov-23							
37								
38								
39								
40								
Coefficient of Variation:		2.79	3.69	0.81	2.15	0.00	2.19	1.29
Mann-Kendall Statistic (S):		-9	-11	-17	-6	0	-7	-2
Confidence Factor:		83.2%	70.5%	89.1%	61.7%	37.9%	86.4%	62.5%
Concentration Trend:		No Trend	No Trend	Stable	No Trend	Stable	No Trend	No Trend



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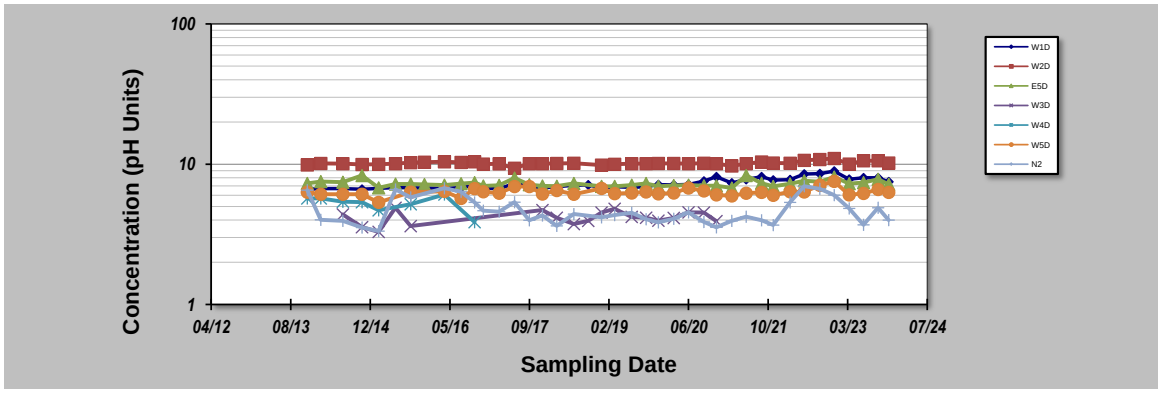
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	19-Jan-24	Job ID:	318001662
Facility Name:	Hydro Kurri Kurri	Constituent:	pH
Conducted By:	Jake Bourke	Concentration Units:	pH Units

Sampling Point ID:	W1D	W2D	E5D	W3D	W4D	W5D	N2
Sampling Event	Sampling Date	PH CONCENTRATION (pH Units)						
1	26-Nov-13	6.62	9.9	7.29		5.7	6.32	6.54
2	18-Feb-14	6.7	10.13	7.53		5.7	6.1	4.01
3	7-Jul-14	6.71	10.1	7.44	4.38	5.4	6.11	3.94
4	4-Nov-14	6.63	9.94	8.32	3.56	5.36	6.11	3.54
5	17-Feb-15		9.99	6.8	3.29	4.69	5.34	3.34
6	3-Jun-15	6.82	10.11	7.23	4.89			6.61
7	7-Sep-15	6.79	10.27	7.23	3.62	5.18	6.32	5.81
8	2-Dec-15		10.34	7.18				
9	5-Apr-16	6.73	10.42	7.1		6.08	6.4	6.75
10	19-Jul-16	6.82	10.29	7.27			5.7	6.37
11	12-Oct-16	7.02	10.4	7.39		3.87	6.7	5.35
12	6-Dec-16	6.78	10.02	7			6.37	4.67
13	15-Mar-17	6.67	10.07	7.08			6.21	4.59
14	20-Jun-17	7.3	9.37	7.97			6.94	5.37
15	21-Sep-17	6.95	10.08	7.16			6.93	3.98
16	12-Dec-17	6.78	10.1	7	4.72		6.13	4.31
17	13-Mar-18	6.91	10.14	6.97	4.16		6.5	3.63
18	28-Jun-18	7.07	10.18	7.29	3.75		6.1	4.41
19	26-Sep-18	7.12			3.94			
20	19-Dec-18	6.76	9.87	6.95	4.53		6.72	4.18
21	11-Mar-19	6.92	9.99	6.96	4.81		6.18	4.34
22	26-Jun-19	6.83	10.1	7.1	4.21		6.23	4.51
23	24-Sep-19	6.91	10.08	7.3	4.15		6.35	4.05
24	11-Dec-19	7.16	10.14	6.95	3.96		6.16	3.85
25	17-Mar-20	7.12	10.12	7.05	4.14		6.24	4.09
26	17-Jun-20	7.17	10.11	7.1	4.54		6.76	4.54
27	22-Sep-20	7.57	10.18	7.04	4.53		6.46	3.88
28	9-Dec-20	8.14	10.09	7.02	3.93		6.05	3.55
29	17-Mar-21	7.34	9.72	6.77			5.95	3.94
30	15-Jun-21	7.78	10.11	8.32			6.21	4.22
31	20-Sep-21	8.13	10.37	7.31			6.31	3.98
32	1-Dec-21	7.71	10.19	6.95			6	3.68
33	17-Mar-22	7.77	10.17	7.24			6.36	5.35
34	15-Jun-22	8.51	10.65	7.62			6.34	6.97
35	20-Sep-22	8.57	10.79	7.51			7.08	6.68
36	20-Dec-22	8.92	10.99	8.1			7.54	6.03
37	24-Mar-23	7.82	10.02	7.26			6.04	4.85
38	22-Jun-23	8	10.6	7.4			6.2	3.7
39	22-Sep-23	8	10.6	7.8			6.6	4.9
40	27-Nov-23	7.5	10.2	7.2			6.3	4
Coefficient of Variation:		0.08	0.03	0.05	0.11	0.13	0.06	0.23
Mann-Kendall Statistic (S):		498	211	11	16	-13	74	-50
Confidence Factor:		>99.9%	99.5%	54.8%	71.3%	92.9%	82.9%	73.0%
Concentration Trend:		Increasing	Increasing	No Trend	No Trend	Prob. Decreasing	No Trend	Stable



Notes:

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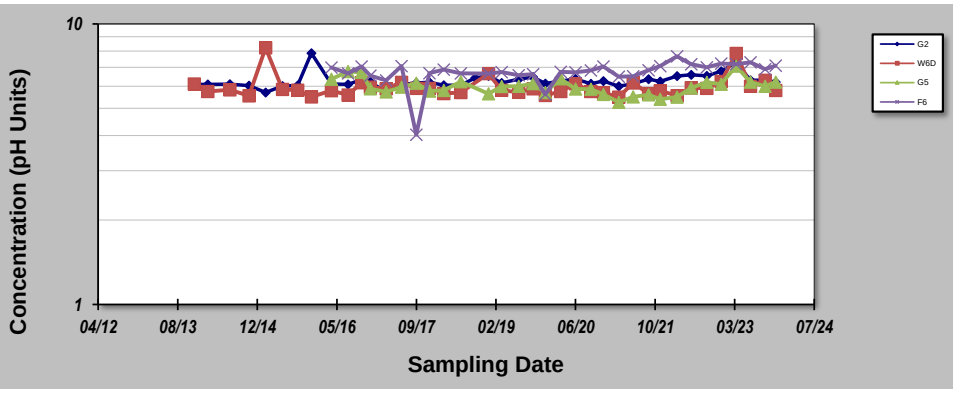
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	19-Jan-24	Job ID:	318001662
Facility Name:	Hydro Kurri Kurri	Constituent:	pH
Conducted By:	Jake Bourke	Concentration Units:	pH Units

Sampling Point ID:	G2	W6D	G5	F6			
Sampling Event	Sampling Date	PH CONCENTRATION (pH Units)						
1	26-Nov-13	6.09	6.11					
2	18-Feb-14	6.09	5.75					
3	7-Jul-14	6.1	5.83					
4	4-Nov-14	6.03	5.54					
5	17-Feb-15	5.7	8.22					
6	3-Jun-15	6.01	5.84					
7	7-Sep-15	6.04	5.81					
8	2-Dec-15	7.87	5.5					
9	5-Apr-16	6.11	5.79	6.36	6.99			
10	19-Jul-16	6.09	5.58	6.77	6.67			
11	12-Oct-16	6.33	6.17	6.72	7.05			
12	6-Dec-16	6.22	5.96	5.88	6.54			
13	15-Mar-17	5.71	5.88	5.73	6.29			
14	20-Jun-17	6.08	6.19	5.96	7.08			
15	21-Sep-17	6.16	5.9	6.15	4.03			
16	12-Dec-17	6.19	5.9	5.77	6.68			
17	13-Mar-18	6.05	5.65	5.8	6.88			
18	28-Jun-18	6.05	5.7	6.23	6.67			
19	26-Sep-18	6.42						
20	19-Dec-18	6.53	6.65	5.64	6.66			
21	11-Mar-19	6.16	5.81	5.99	6.73			
22	26-Jun-19	6.35	5.71	6	6.57			
23	24-Sep-19	6.46	5.87	6.13	6.62			
24	11-Dec-19	6.13	5.56	5.7	5.61			
25	17-Mar-20	6.26	5.75	6.38	6.75			
26	17-Jun-20	6.37	6.12	5.86	6.72			
27	22-Sep-20	6.12	5.75	5.85	6.83			
28	9-Dec-20	6.26	5.69	5.61	7.05			
29	17-Mar-21	6	5.49	5.26	6.49			
30	15-Jun-21	6.12	6.16	5.5	6.51			
31	20-Sep-21	6.36	5.65	5.59	6.84			
32	1-Dec-21	6.24	5.78	5.39	7.08			
33	17-Mar-22	6.52	5.55	5.49	7.67			
34	15-Jun-22	6.59	5.92	5.92	7.19			
35	20-Sep-22	6.53	5.9	6.19	7.01			
36	20-Dec-22	6.78	6.24	6.1	7.22			
37	24-Mar-23	7.28	7.86	7.08	7.19			
38	22-Jun-23	6.3	6	6.2	7.3			
39	22-Sep-23	6.3	6.3	6	6.9			
40	27-Nov-23	6.2	5.8	6.2	7.1			
Coefficient of Variation:		0.06	0.09	0.07	0.09			
Mann-Kendall Statistic (S):		315	53	-47	169			
Confidence Factor:		>99.9%	73.4%	78.1%	99.8%			
Concentration Trend:		Increasing	No Trend	Stable	Increasing			



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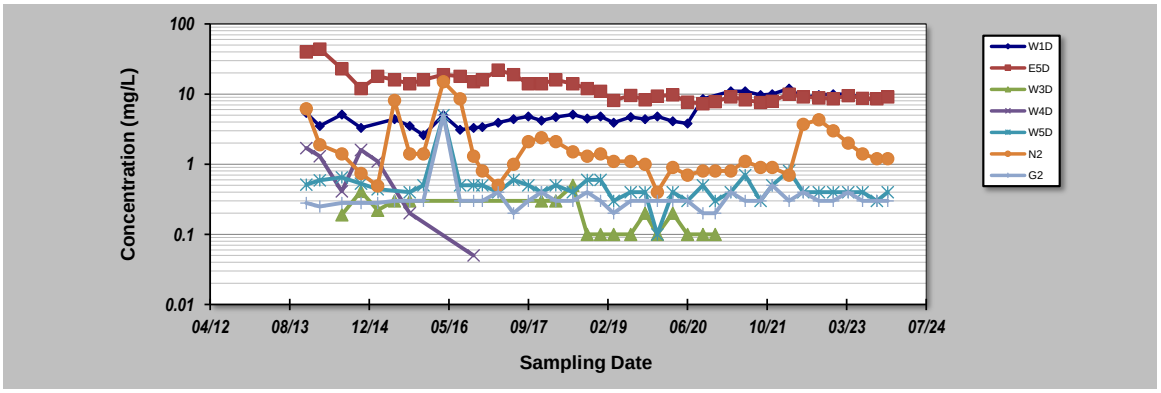
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	19-Jan-24	Job ID:	318001662
Facility Name:	Hydro Kurri Kurri	Constituent:	Soluble Fluoride
Conducted By:	Jake Bourke	Concentration Units:	mg/L

Sampling Point ID:	W1D	E5D	W3D	W4D	W5D	N2	G2
Sampling Event	Sampling Date	SOLUBLE FLUORIDE CONCENTRATION (mg/L)						
1	26-Nov-13	5.4	40		1.7	0.51	6.2	0.28
2	18-Feb-14	3.5	44		1.3	0.59	1.9	0.25
3	7-Jul-14	5.1	23	0.19	0.41	0.65	1.4	0.28
4	4-Nov-14	3.3	12	0.41	1.6	0.53	0.74	0.28
5	17-Feb-15		18	0.22	1.1	0.44	0.49	0.28
6	3-Jun-15	4.4	16	0.3			8.1	0.3
7	7-Sep-15	3.5	14	0.3	0.2	0.4	1.4	0.3
8	2-Dec-15	2.6	16			0.5	1.4	0.3
9	5-Apr-16	5	19			5	15	5
10	19-Jul-16	3.1	18			0.5	8.6	0.3
11	12-Oct-16	3.3	15		0.05	0.5	1.3	0.3
12	6-Dec-16	3.4	16			0.5	0.8	0.3
13	15-Mar-17	3.9	22			0.4	0.5	0.4
14	20-Jun-17	4.4	19			0.6	1	0.2
15	21-Sep-17	4.8	14			0.5	2.1	0.3
16	12-Dec-17	4.2	14	0.3		0.4	2.4	0.4
17	13-Mar-18	4.7	16	0.3		0.5	2.1	0.3
18	28-Jun-18	5.1	14	0.5		0.4	1.5	0.3
19	26-Sep-18	4.5	12	0.1		0.6	1.3	0.4
20	19-Dec-18	4.8	11	0.1		0.6	1.4	0.3
21	11-Mar-19	3.9	8.1	0.1		0.3	1.1	0.2
22	26-Jun-19	4.7	9.6	0.1		0.4	1.1	0.3
23	24-Sep-19	4.4	8.3	0.2		0.4	1	0.3
24	11-Dec-19	4.8	9.4	0.1		0.1	0.4	0.3
25	17-Mar-20	4.1	9.8	0.2		0.4	0.9	0.3
26	17-Jun-20	3.8	7.7	0.1		0.3	0.7	0.3
27	22-Sep-20	8.5	7.3	0.1		0.5	0.8	0.2
28	8-Dec-20		7.8	0.1		0.3	0.8	0.2
29	17-Mar-21	11	9.1			0.4	0.8	0.4
30	15-Jun-21	11	8.3			0.7	1.1	0.3
31	20-Sep-21	9.7	7.6			0.3	0.9	0.3
32	1-Dec-21	10	7.9			0.5	0.9	0.5
33	17-Mar-22	12	10			0.8	0.7	0.3
34	15-Jun-22	8.8	9.1			0.4	3.7	0.4
35	20-Sep-22	9.7	8.8			0.4	4.3	0.3
36	20-Dec-22	10	8.6			0.4	3	0.3
37	24-Mar-23	10	9.5			0.4	2	0.4
38	22-Jun-23	8.8	8.7			0.4	1.4	0.3
39	21-Sep-23	8.3	8.6			0.3	1.2	0.3
40	28-Nov-23	9.4	9.1			0.4	1.2	0.3
Coefficient of Variation:		0.46	0.58	0.59	0.75	1.30	1.28	1.75
Mann-Kendall Statistic (S):		336	-466	-62	-15	-231	-101	142
Confidence Factor:		>99.9%	>99.9%	99.0%	98.5%	99.8%	87.7%	95.0%
Concentration Trend:		Increasing	Decreasing	Decreasing	Decreasing	Decreasing	No Trend	Prob. Increasing



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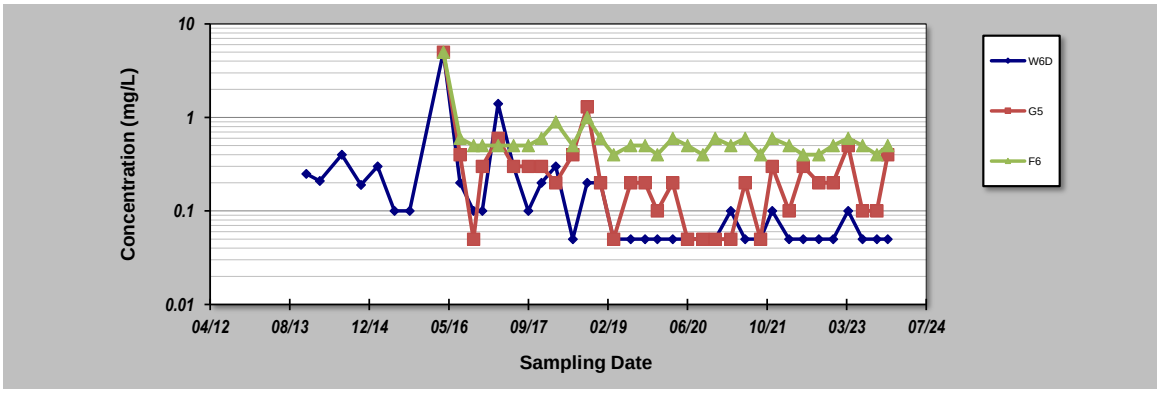
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	19-Jan-24	Job ID:	318001662
Facility Name:	Hydro Kurri Kurri	Constituent:	Soluble Fluoride
Conducted By:	Jake Bourke	Concentration Units:	mg/L

Sampling Point ID:	W6D	G5	F6				
Sampling Event	Sampling Date	SOLUBLE FLUORIDE CONCENTRATION (mg/L)						
1	26-Nov-13	0.25						
2	18-Feb-14	0.21						
3	7-Jul-14	0.4						
4	4-Nov-14	0.19						
5	17-Feb-15	0.3						
6	3-Jun-15	0.1						
7	7-Sep-15	0.1						
8	2-Dec-15							
9	5-Apr-16	5	5	5				
10	19-Jul-16	0.2	0.4	0.6				
11	12-Oct-16	0.1	0.05	0.5				
12	6-Dec-16	0.1	0.3	0.5				
13	15-Mar-17	1.4	0.6	0.5				
14	20-Jun-17	0.3	0.3	0.5				
15	21-Sep-17	0.1	0.3	0.5				
16	12-Dec-17	0.2	0.3	0.6				
17	13-Mar-18	0.3	0.2	0.9				
18	28-Jun-18	0.05	0.4	0.5				
19	26-Sep-18	0.2	1.3	1				
20	19-Dec-18	0.2	0.2	0.6				
21	11-Mar-19	0.05	0.05	0.4				
22	26-Jun-19	0.05	0.2	0.5				
23	24-Sep-19	0.05	0.2	0.5				
24	11-Dec-19	0.05	0.1	0.4				
25	17-Mar-20	0.05	0.2	0.6				
26	17-Jun-20	0.05	0.05	0.5				
27	22-Sep-20	0.05	0.05	0.4				
28	8-Dec-20	0.05	0.05	0.6				
29	17-Mar-21	0.1	0.05	0.5				
30	15-Jun-21	0.05	0.2	0.6				
31	20-Sep-21	0.05	0.05	0.4				
32	1-Dec-21	0.1	0.3	0.6				
33	17-Mar-22	0.05	0.1	0.5				
34	15-Jun-22	0.05	0.3	0.4				
35	20-Sep-22	0.05	0.2	0.4				
36	20-Dec-22	0.05	0.2	0.5				
37	24-Mar-23	0.1	0.5	0.6				
38	22-Jun-23	0.05	0.1	0.5				
39	21-Sep-23	0.05	0.1	0.4				
40	28-Nov-23	0.05	0.4	0.5				
Coefficient of Variation:		2.90	2.19	1.19				
Mann-Kendall Statistic (S):		-355	-107	-108				
Confidence Factor:		>99.9%	95.8%	95.9%				
Concentration Trend:		Decreasing	Decreasing	Decreasing				



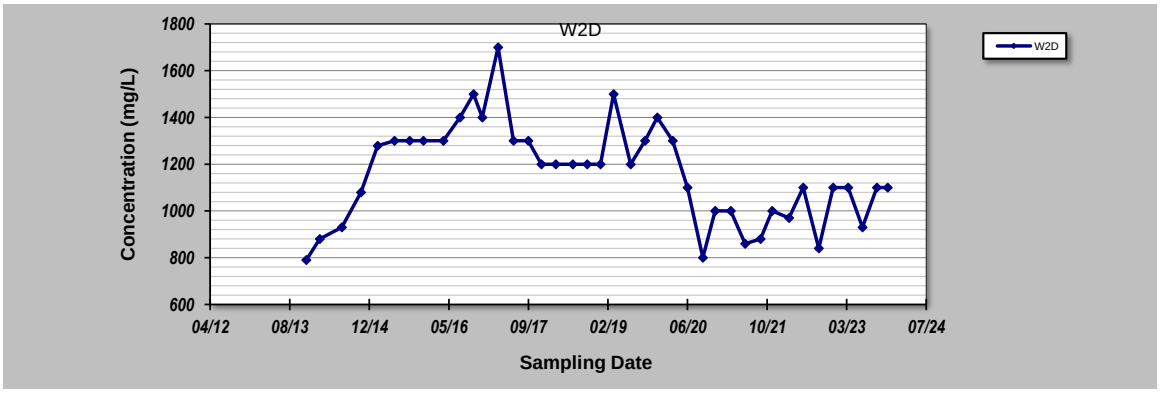
Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	19-Jan-24	Job ID:	318001662
Facility Name:	Hydro Kurri Kurri	Constituent:	Soluble Fluoride
Conducted By:	Jake Bourke	Concentration Units:	mg/L
Sampling Point ID:	W2D		

Sampling Event	Sampling Date	SOLUBLE FLUORIDE CONCENTRATION (mg/L)
1	26-Nov-13	790
2	18-Feb-14	880
3	7-Jul-14	930
4	4-Nov-14	1080
5	17-Feb-15	1279
6	3-Jun-15	1300
7	7-Sep-15	1300
8	2-Dec-15	1300
9	5-Apr-16	1300
10	19-Jul-16	1400
11	12-Oct-16	1500
12	6-Dec-16	1400
13	15-Mar-17	1700
14	20-Jun-17	1300
15	21-Sep-17	1300
16	12-Dec-17	1200
17	13-Mar-18	1200
18	28-Jun-18	1200
19	26-Sep-18	1200
20	19-Dec-18	1200
21	11-Mar-19	1500
22	26-Jun-19	1200
23	24-Sep-19	1300
24	11-Dec-19	1400
25	17-Mar-20	1300
26	17-Jun-20	1100
27	22-Sep-20	800
28	8-Dec-20	1000
29	17-Mar-21	1000
30	15-Jun-21	860
31	20-Sep-21	880
32	1-Dec-21	1000
33	17-Mar-22	970
34	15-Jun-22	1100
35	20-Sep-22	840
36	20-Dec-22	1100
37	24-Mar-23	1100
38	22-Jun-23	930
39	21-Sep-23	1100
40	28-Nov-23	1100
Coefficient of Variation:		0.18
Mann-Kendall Statistic (S):		-191
Confidence Factor:		98.7%
Concentration Trend:		Decreasing



Notes:

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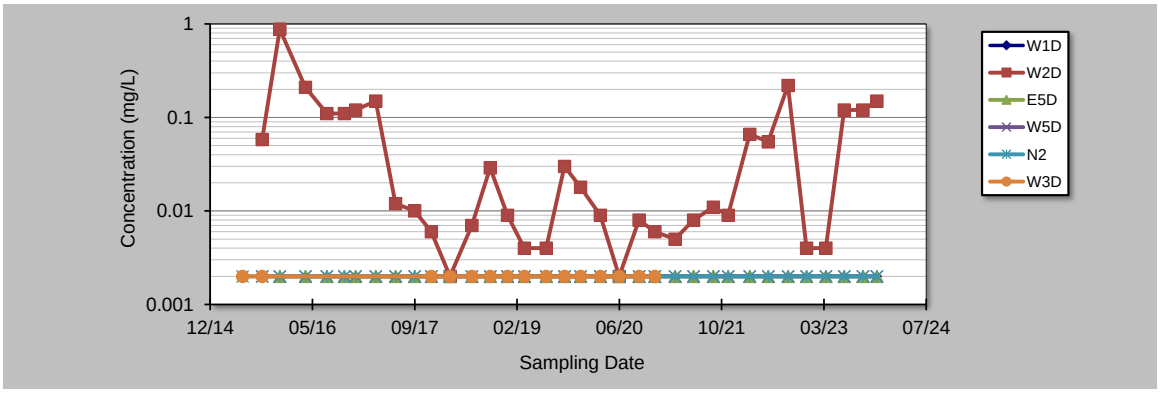
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	19-Jan-24	Job ID:	318001662
Facility Name:	Hydro Kurri Kurri	Constituent:	Free Cyanide
Conducted By:	Jake Bourke	Concentration Units:	mg/L

Sampling Point ID:	W1D	W2D	E5D	W5D	N2	W3D	
Sampling Event	Sampling Date	FREE CYANIDE CONCENTRATION (mg/L)						
1	3-Jun-15					0.002	0.002	
2	7-Sep-15		0.058		0.002	0.002	0.002	
3	2-Dec-15		0.88	0.002	0.002	0.002		
4	5-Apr-16	0.002	0.21	0.002	0.002	0.002		
5	19-Jul-16	0.002	0.11	0.002	0.002	0.002		
6	12-Oct-16	0.002	0.11	0.002	0.002	0.002		
7	6-Dec-16	0.002	0.12	0.002	0.002	0.002		
8	15-Mar-17	0.002	0.15	0.002	0.002	0.002		
9	20-Jun-17	0.002	0.012	0.002	0.002	0.002		
10	21-Sep-17		0.01	0.002	0.002	0.002		
11	12-Dec-17	0.002	0.006	0.002	0.002	0.002	0.002	
12	13-Mar-18	0.002	0.002	0.002	0.002	0.002	0.002	
13	28-Jun-18	0.002	0.007	0.002	0.002	0.002	0.002	
14	26-Sep-18	0.002	0.029	0.002	0.002	0.002	0.002	
15	19-Dec-18	0.002	0.009	0.002	0.002	0.002	0.002	
16	11-Mar-19	0.002	0.004	0.002	0.002	0.002	0.002	
17	26-Jun-19	0.002	0.004	0.002	0.002	0.002	0.002	
18	24-Sep-19	0.002	0.03	0.002	0.002	0.002	0.002	
19	11-Dec-19	0.002	0.018	0.002	0.002	0.002	0.002	
20	17-Mar-20	0.002	0.009	0.002	0.002	0.002	0.002	
21	17-Jun-20	0.002	0.002	0.002	0.002	0.002	0.002	
22	22-Sep-20	0.002	0.008	0.002	0.002	0.002	0.002	
23	8-Dec-20	0.002	0.006	0.002	0.002	0.002	0.002	
24	17-Mar-21	0.002	0.005	0.002	0.002	0.002		
25	15-Jun-21	0.002	0.008	0.002	0.002	0.002		
26	20-Sep-21	0.002	0.011	0.002	0.002	0.002		
27	1-Dec-21	0.002	0.009	0.002	0.002	0.002		
28	17-Mar-22	0.002	0.066	0.002	0.002	0.002		
29	15-Jun-22	0.002	0.055	0.002	0.002	0.002		
30	20-Sep-22	0.002	0.22	0.002	0.002	0.002		
31	20-Dec-22	0.002	0.004	0.002	0.002	0.002		
32	24-Mar-23	0.002	0.004	0.002	0.002	0.002		
33	22-Jun-23	0.002	0.12	0.002	0.002	0.002		
34	21-Sep-23	0.002	0.12	0.002	0.002	0.002		
35	28-Nov-23	0.002	0.15	0.002	0.002	0.002		
36								
37								
38								
39								
40								
Coefficient of Variation:		0.00	2.06	0.00	0.00	0.00	0.00	
Mann-Kendall Statistic (S):		0	-62	0	0	0	0	
Confidence Factor:		49.4%	81.6%	49.4%	49.4%	49.5%	48.0%	
Concentration Trend:		Stable	No Trend	Stable	Stable	Stable	Stable	



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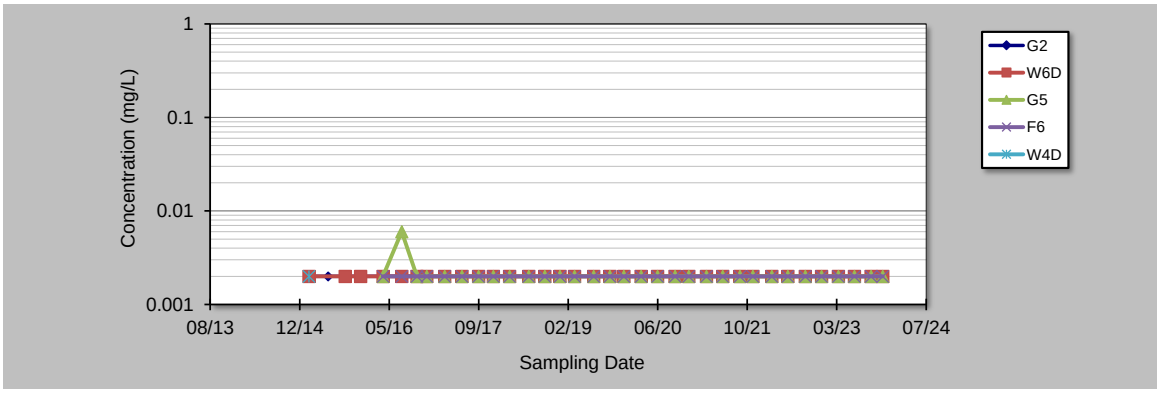
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	19-Jan-24	Job ID:	318001662
Facility Name:	Hydro Kurri Kurri	Constituent:	Free Cyanide
Conducted By:	Jake Bourke	Concentration Units:	mg/L

Sampling Point ID:	G2	W6D	G5	F6	W4D		
Sampling Event	Sampling Date	FREE CYANIDE CONCENTRATION (mg/L)						
1	17-Feb-15	0.002	0.002			0.002		
2	3-Jun-15	0.002						
3	7-Sep-15		0.002					
4	2-Dec-15	0.002	0.002					
5	5-Apr-16	0.002	0.002	0.002	0.002			
6	19-Jul-16	0.002	0.002	0.006	0.002			
7	12-Oct-16	0.002	0.002	0.002	0.002			
8	6-Dec-16	0.002	0.002	0.002	0.002			
9	15-Mar-17	0.002	0.002	0.002	0.002			
10	20-Jun-17	0.002	0.002	0.002	0.002			
11	21-Sep-17	0.002	0.002	0.002	0.002			
12	12-Dec-17	0.002	0.002	0.002	0.002			
13	13-Mar-18	0.002	0.002	0.002	0.002			
14	28-Jun-18	0.002	0.002	0.002	0.002			
15	26-Sep-18	0.002	0.002	0.002	0.002			
16	19-Dec-18	0.002	0.002	0.002	0.002			
17	11-Mar-19	0.002	0.002	0.002	0.002			
18	26-Jun-19	0.002	0.002	0.002	0.002			
19	24-Sep-19	0.002	0.002	0.002	0.002			
20	11-Dec-19	0.002	0.002	0.002	0.002			
21	17-Mar-20	0.002	0.002	0.002	0.002			
22	17-Jun-20	0.002	0.002	0.002	0.002			
23	22-Sep-20	0.002	0.002	0.002	0.002			
24	8-Dec-20	0.002	0.002	0.002	0.002			
25	17-Mar-21	0.002	0.002	0.002	0.002			
26	15-Jun-21	0.002	0.002	0.002	0.002			
27	20-Sep-21	0.002	0.002	0.002	0.002			
28	1-Dec-21	0.002	0.002	0.002	0.002			
29	17-Mar-22	0.002	0.002	0.002	0.002			
30	15-Jun-22	0.002	0.002	0.002	0.002			
31	20-Sep-22	0.002	0.002	0.002	0.002			
32	20-Dec-22	0.002	0.002	0.002	0.002			
33	24-Mar-23	0.002	0.002	0.002	0.002			
34	22-Jun-23	0.002	0.002	0.002	0.002			
35	22-Sep-23	0.002	0.002	0.002	0.002			
36	27-Nov-23	0.002	0.002	0.002	0.002			
37								
38								
39								
40								
Coefficient of Variation:		0.00	0.00	0.33	0.00			
Mann-Kendall Statistic (S):		0	0	-29	0			
Confidence Factor:		49.5%	49.5%	67.4%	49.4%			
Concentration Trend:		Stable	Stable	Stable	Stable			



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