

Quarterly Water Quality Monitoring Results, Cabbage Tree Road Sand Quarry, NSW May 2024 Monitoring Event

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Subject: Quarterly Water Quality Monitoring Results, Cabbage Tree
Road Sand Quarry, NSW
May 2024 Monitoring Event

1 INTRODUCTION

This report presents water quality monitoring results for the May 2024 monitoring event undertaken by Kleinfelder Australia Pty Ltd (Kleinfelder) at the Cabbage Tree Road Sand Quarry, NSW (herein referred to as the 'site'). This report summarises the required monitoring data under the NSW Environment Protection Authority (EPA) Environment Protection License (EPL) No. 21264, and the site-specific Soil and Water Management Plan (SWMP).

The scheduled monthly monitoring event was conducted on 21st May 2024 and included:

- Gauging the depth to water and total depth (relative to the top of the groundwater well casing) within 14 groundwater monitoring wells,
- The collection of water samples from 10 groundwater monitoring wells and 4 surface water locations, and
- Recording of field parameters (including pH, electrical conductivity, temperature, dissolved oxygen, turbidity, total dissolved solids, and redox potential) for sampled groundwater and surface water locations.

All investigations were undertaken in accordance with relevant Australian Standards and applicable guidance material (sampling and investigation methodologies available upon request).

Monitoring locations are illustrated by the site plan provided in **Attachment 1**.

The following sections present the results obtained for monitoring conducted in May 2024. Results have been colour-coded to identify exceedances of the adopted trigger values, with a discussion provided for long-term trends and results exceeding the trigger values, where required. It is noted that the sand wash plant was found to be nonoperational during this quarterly monitoring event and unable to be sampled. Sampling for Wash Plant Water and Wash Plant Fines will be conducted during the next available monitoring event to ensure continuity.

2 GROUNDWATER MONITORING

Groundwater monitoring is undertaken in accordance with National Environment Protection Council (2013), National Environment Protection (Assessment of Site Contamination) Measure (NEPM), and New South Wales Environment Protection Authority (2022), Contaminated Land Guidelines Sampling Design Part 1 – Application.



2.1 EPL Groundwater Monitoring Sites

Table 1 below details the monitoring results for May 2024, in accordance with the requirements of the EPL and the SWMP.

Table 1: Groundwater Monitoring Results – EPL Monitoring Sites

Monitoring Well (LDP number in parentheses)	Metals (mg/L)								Inorganics & Other			Gauging			
	Arsenic	Barium	Chromium	Copper	Iron	Manganese	Nickel	Zinc	Field EC (µS/cm)	Field pH (pH units)	Field Turbidity (NTU)	Depth to Water (mbTOC)	GWE	Max inferred ¹	Difference between max inferred and GWE
	SWMP Trigger Values											Refer to Section 2.3, Table 3			
	0.003	0.07	0.004	0.083	4.1	0.136	0.02	0.085	500	4.2 – 6.5	N/A				
EPL Monitoring Sites															
BH2 (LDP001)	<0.001	0.001	<0.001	----	<0.001	<0.001	0.001	0.022	37.7	4.71	21.9	4.749	3.041	3.8	0.759
BH4 (LDP002)	<0.001	0.007	<0.001	----	0.09	0.009	<0.001	<0.005	104.2	5.02	15.6	0.822	2.238	3.0 ²	0.762
BH6 (LDP003)	<0.001	0.013	<0.001	----	<0.001	0.003	<0.001	<0.005	168.5	4.86	33.8	0.716	2.902	4.4	1.498
BH7 (LDP004)	<0.001	0.024	<0.001	----	<0.001	0.088	0.005	0.25	102.2	4.33	3.40	0.918	2.062	3.7	1.638
BH9A (LDP005)	<0.001	0.003	<0.001	----	<0.001	0.021	0.001	0.017	84.2	4.92	15.2	8.464	2.286	4.0 ²	1.714
BH11 (LDP006)	<0.001	0.003	0.002	----	0.003	0.001	0.002	0.043	82	4.21	5.78	2.237	4.393	5.5	1.107
MW239S (LDP007)	<0.001	0.002	0.002	----	<0.001	0.004	0.002	0.064	100.4	4.46	27.9	0.521	2.519	3.9 ³	1.381

Notes:

< – less than the laboratory limit of reporting

mg/L – milligrams per litre

µS/cm – micro siemens per centimetre

NTU – Nephelometric Turbidity Units

mbTOC – metres below top of casing

1 – Sourced from Watershed HydroGeo ,2019, Maximum Extraction Depth Management Plan, Cabbage Tree Road Sand Quarry, May 2019.

2 – Inferred Max Groundwater level based on adjacent wells (BH4 & BH9).

3 – Inferred Max Groundwater level based on adjacent well (MW239S).

* – Result based on laboratory analytical results



2.2 Non-EPL Groundwater Monitoring Sites

Table 2 below details the monitoring results for May 2024 from monitoring sites which are included in the SWMP but are not required under the EPL.

Table 2: Groundwater Results Non-EPL Monitoring Sites

Monitoring Well	Metals (mg/L)								Inorganics & Other			Gauging			
	Arsenic	Barium	Chromium	Copper	Iron	Manganese	Nickel	Zinc	EC (µS/cm)	pH (pH units)	Turbidity (NTU)	Depth to Water (mbTOC)	GWE	Max Inferred ¹	Difference between Max inferred and GWE
	SWMP Trigger Values								Refer to Table 3			Refer to Table 3			
	0.003	0.07	0.004	0.083	4.1	0.136	0.02	0.085	500	4.2 – 6.5	N/A				
Non-EPL Monitoring Sites															
BH1A	<0.001	0.007	<0.001	<0.001	<0.05	0.004	<0.001	0.005	80.6	4.46*	13.20	5.153	3.827	4.5 ²	0.673
BH5	-	-	-	-	-	-	-	-	-	-	-	5.010	2.35	4.0	1.65
BH8	<0.001	0.004	0.002	<0.001	1.47	0.002	0.001	0.006	119	4.56	35.61	1.642	2.238	4.0	1.762
BH12A	<0.001	0.002	0.002	<0.001	2.05	0.024	<0.001	0.007	102.5	4.52	8.07	2.530	3.09	4.0 ³	0.91

Notes:

< – less than the laboratory limit of reporting

* Result based on laboratory analytical result

mg/L – milligrams per litre

µS/cm – micro siemens per centimetre

NTU – Nephelometric Turbidity Units

mbTOC – metres below top of casing

¹ – Sourced from Watershed HydroGeo ,2019, *Maximum Extraction Depth Management Plan, Cabbage Tree Road Sand Quarry, May 2019.*

² – Inferred Max Groundwater level based on former adjacent well (BH1).

³ – Inferred Max Groundwater level based on former adjacent well (BH12).



2.3 Trigger Values for Groundwater Depth

Table 3 presents the trigger values adopted for groundwater depth, as per Watershed HydroGeo (2019). The inferred maximum historical groundwater elevations are provided in Watershed HydroGeo (2019).

Table 3: Groundwater Level Monitoring TARP Rules (Watershed HydroGeo, 2019)

Level	Trigger	Action and Response	Report / Response Actions
0	Groundwater levels more than 0.5 m below <i>inferred</i> maximum historical level.	Standard operations – monthly dipping of operational on-site monitoring bores.	N/A
1	Groundwater levels within 0.5 m below <i>inferred</i> maximum historical level at any on-site bore.	Weekly (or more frequent) monitoring (dipping) of groundwater levels until water level declines to below high frequency level bores.	Internal and environmental consultant. Include note in Annual Report.
2	Groundwater levels within 0.25 m of <i>inferred</i> maximum historical level at any on-site bore.	Weekly (or more frequent) monitoring (dipping) of groundwater levels. Re-analysis and review of Minimum Extraction Level (MEL).	WSS to issue letter to DPIE, documenting groundwater level and rainfall trends, review and make recommendations regarding MEL.
3	Groundwater levels within resource area rise above previously <i>inferred</i> maximum groundwater level.	Analysis of recent data by hydrogeologist, including site data and data from local HWC wells and local Defence wells (if available). Revision of MEL. Remediation of earlier excavations to revised MEL if required by DPIE.	WSS to issue letter to DPIE, DoI Water and HWC, documenting groundwater level trends, and revision (if necessary) of MEL. Letter to outline remedial options, considering access, vegetation condition in previously rehabilitated areas. Re-grading of previously rehabilitated areas if required by DPIE.

2.4 Groundwater Trends and Discussion

In accordance with the SWMP, an exceedance of the trigger value does not necessarily indicate that there is an unacceptable risk on site, but rather a trigger for further investigation or evaluation of management options, as monitoring results may naturally exceed trigger values. pH and EC results exceeded the SWMP trigger values in the April 2024 monitoring event but did not exceed the SWMP trigger values during the May event, indicating that no further trigger investigation is required for these previously recorded exceedances. Concentrations of Zinc were reported greater than the site-specific trigger value (0.085mg/L) at BH07 (0.25mg/L).

The zinc result was confirmed with the laboratory and was determined not to be significantly above the trigger value (i.e., less than 5 times the trigger value). In accordance with the SWMP, BH7 will be re-sampled for zinc in the June 2024 monitoring event to determine if this exceedance is an isolated occurrence. Reported exceedances in zinc concentrations within groundwater, above the site-specific trigger values at BH7, may be attributed to the high level of rainfall experienced during and leading up to the May event, and were unable to be directly related to quarrying activities. Based on the results obtained, the need for a site-specific trigger investigation was not required at this time.

Reported results for BTEXN and TRH constituents (provided in **Attachment 3**) were below the laboratory Limit of Reporting (LoR) in all groundwater monitoring well locations.

Gauging data and field measurements obtained during groundwater monitoring are provided in **Attachment 2**.

3 SURFACE WATER MONITORING

Surface water monitoring is undertaken in accordance with National Environment Protection Council (2013), National Environment Protection (Assessment of Site Contamination) Measure (NEPM), and New South Wales Environment Protection Authority (2022), Contaminated Land Guidelines Sampling Design Part 1 – Application.



3.1 Surface Water Monitoring Results

Surface water monitoring is completed on a quarterly basis as per the SWMP. May2024 monthly water quality monitoring event would not normally include surface water monitoring within the scope of works, however due to metals detections and low pH results from the previous event, surface water sampling has been conducted again.

Table 4 below details the monitoring results for May 2024 from surface water monitoring sites.

Table 4: Surface Water Monitoring Results

Location	Metals (mg/L)											Inorganics & Other		
	Arsenic	Barium	Boron	Chromium	Copper	Cobalt	Iron	Magnesium	Manganese	Nickel	Zinc	EC (µS/cm)	pH (pH units)	Turbidity (NTU)
	SWMP Trigger Values													
	0.006	0.08	0.10	0.004	0.033	0.006	7.25 (SW1&2)	32 (SW3&4)	52	0.841	0.02	0.535	500	4.2 – 6.5
SW1	0.002	0.011	<0.05	0.003	0.012	0.001	5.72	3	0.089	0.003	0.079	132.4	5.15	1.53
SW2	<0.001	0.008	<0.05	0.002	<0.001	0.001	0.98	3	0.049	0.002	0.11	108.6	4.21	0.28
SW3	<0.001	0.022	<0.05	<0.001	<0.001	0.004	8.43	3	0.067	0.005	0.026	257.8	3.60*	8.09
SW4	<0.001	0.027	<0.05	<0.001	<0.001	0.004	2.4	4	0.048	0.004	0.027	216.2	5.08	3.3

Notes:

< – less than the laboratory limit of reporting

mg/L – milligrams per litre

µS/cm – micro siemens per centimetre

NTU – Nephelometric Turbidity Units

* - Result based on laboratory analytical results



3.2 Surface Water Trends and Discussion

In accordance with the SWMP, an exceedance of the trigger value does not necessarily indicate that there is an unacceptable risk on site, but rather a trigger for further investigation or evaluation of management options, as monitoring results may naturally exceed trigger values. pH at SW3 (3.60) marginally exceeded the site-specific trigger value range (4.2 - 6.5 pH) during the May monitoring event. This location also marginally exceeded the trigger value for pH during the April monitoring event.

Reported exceedances of pH were investigated and determined potentially due to development works being undertaken on a residential property adjacent to the site, within proximity of SW3. These results, however, did not contribute to significantly increased solubility and mobility of metals concentrations within surface water, which remained below the site-specific trigger values at all surface water monitoring locations.

In accordance with the SWMP, pH concentrations at SW3 were reported above the adopted trigger value, but were within the range of previous data obtained from the site, suggesting that an incorrectly set trigger value may be in place at SW3 that does not fully account for seasonal changes. Consideration should be given to updating this trigger value during the next management plan update.

Continued monitoring of pH trends will be conducted during subsequent monitoring events. Based on the results obtained, the need for a site-specific trigger investigation was not required at this time.

Reported results for BTEXN and TRH constituents (provided in **Attachment 3**) were below the laboratory Limit of Reporting (LoR) in all surface water monitoring well locations.

Gauging data and field measurements obtained during surface water monitoring are provided in **Attachment 2**.

4 PFAS MONITORING

Per- and Polyfluoroalkyl Substances (PFAS) monitoring could not be conducted at the wash plant during this event as it was not operational during the monitoring event. PFAS samples will be collected from the wash plant in during the upcoming June 2024 event.



5 METEOROLOGY

Rainfall data was obtained from the Bureau of Meteorology Williamtown RAAF AWS (Station No. 061078, [Williamtown, NSW - Daily Weather Observations \(bom.gov.au\)](http://Williamtown.NSW-DailyWeatherObservations(bom.gov.au))) for the 12 months preceding the May 2024 monitoring event.

Since May 2023, the recorded monthly rainfall total has fallen below the historical average, except during the February 2024 event which reported an elevated albeit average rainfall. The rainfall total to date for May 2024 has been above the monthly mean and previous months total. Based on current rainfall data (mean and monthly totals) for May 2024 and preceding data, it is expected that groundwater elevations will rise during the subsequent months due to a lag in groundwater response, consistent with current groundwater trend data.

6 ATTACHMENTS

Attachment 1	Site Monitoring Locations
Attachment 2	Gauging Data and Field Records
Attachment 3	Long-term Results Tables
Attachment 4	NATA Accredited Laboratory reports and Chain of Custody (COC) Documentation
Attachment 5	Long-term Trends

Attachments available online via [Cabbage Tree Road Sand Quarry](#)

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