

Monthly Water Quality Monitoring Results Cabbage Tree Road Sand Quarry, NSW March 2022 Monitoring Event

NCA22R139010

20 April 2022



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Williamstown Sand Syndicate (WSS)
PO Box 898
Newcastle, NSW 2300

Attention: Darren Williams

Subject: Monthly Water Quality Monitoring Results Cabbage Tree
Road Sand Quarry, NSW
March 2022 Monitoring Event

Please find enclosed the monthly water quality monitoring results for the March 2022 monitoring event undertaken by Kleinfelder at the Cabbage Tree Road Sand Quarry, NSW.

1 SCOPE OF WORK

The scope of work presented in this report includes the results from the monthly groundwater monitoring event undertaken in accordance with the NSW Environment Protection Authority (EPA) and Department of Planning, Industry and Environment (DPIE) requirements for monthly water quality monitoring at the quarry. **Figure 1 (Attachment 1)** presents the groundwater sampling locations.

The scheduled March 2022 monthly monitoring event included gauging of eight monitoring wells, recording of field parameters for groundwater, and sampling from seven monitoring wells and one wash plant water sample as outlined in the Soil and Water Management Plan (SWMP, 2021).

2 SITE WORK

The monthly monitoring round was conducted on 17 March 2022 and comprised:

- Gauging of eight monitoring wells (BH2, BH4, BH6, BH7, BH9, BH9A, BH11 & MW239S).
- Groundwater sampling from seven monitoring wells (BH2, BH4, BH6, BH7, BH9A, BH11 & MW239S) as summarised in **Table 5** and detailed in **Attachment 2**.
- Surface water sampling from one location (SW2) as summarised in **Table 6** and detailed in **Attachment 2**. This was an additional sample (outside of the March 2022 scope) that was required due to elevated iron, anion and nutrient concentrations exceeding the Site-specific Trigger Values at SW2 during the previous February groundwater monitoring event, as per the SWMP.
- One wash plant water sample (WPW) as summarised in **Table 7** and detailed in **Attachment 2**.

Each well location was gauged using a water level meter to determine groundwater depth (relative to the top of the well casing) and the total depth of the well in order to determine potential sand/silt inundation and potential maintenance requirements. Following gauging, a HydraSleeve was placed into the well, ensuring the top of the sleeve was located below the water column to be sampled, and suspended in place while all remaining wells were gauged. Each HydraSleeve was then removed from the well and representative groundwater samples taken.

Surface and wash plant water samples were taken directly into laboratory supplied sample containers using a gloved hand. Where access was deemed unsafe, a telescopic sampling pole was used.

All samples collected were placed into an ice chilled esky and then submitted to a NATA accredited laboratory under a chain of custody (COC) for the analytical schedule as per **Table 1**.

Table 1: Summary of Monthly Water Quality Analysis (March 2022)

Analysis	Number of Samples				
	Primary	Intra-lab (Duplicate)	Inter-lab (Triplicate)	Transport Blank	Rinsate Blank
Metals*	9	1	1	1	1



Analysis	Number of Samples				
	Primary	Intra-lab (Duplicate)	Inter-lab (Triplicate)	Transport Blank	Rinsate Blank
PFAS (28 analytes, standard level)	1	1	1	1	1
Extended Water Quality Suite**	1	0	0	0	0

* Metals (dissolved) - Arsenic (As), Iron (Fe), Manganese (Mn).

** Extended Water Quality Suite – Anion (reactive P), nutrients (NH₃, NO₃ and NO₂).

Table 2 provides a summary of the gauging data. The full set of gauging data for each monitoring location is provided in **Table 5, Attachment 2**. Additionally, Watershed HydroGeo (2019) outlined a Trigger Action and Response Plan (TARP) to mitigate groundwater elevations that may potentially impact Cabbage Tree Road Sand Quarry operations (primarily sand excavation depths). Based on these recommendations, groundwater elevation has been shaded to correspond to triggers and actions outlined in **Table 3**.

Table 2: Summary of Gauging Data

Borehole	Top of Casing (mAHD)	Depth to Water (mBTOC)	Ground-water Elevation (mAHD)	Well Total Depth Current (mBTOC)	Well Total Depth 2014 (mBTOC)	Inferred Max GW Elevation (mAHD) ¹	Difference Between Inferred Max and Measured GW Elevation (mAHD)	Comment
BH1	8.64	-	-	-	9.45	4.5	-	No sample taken
BH2	7.79	4.423	3.367	8.95	9.45	3.8	0.433	Light brown, no odour / sheen, well in good condition
BH3	-	-	-	-	-	-	-	Well decommissioned
BH4	3.06	0.833	2.227	6.04	6.45	3.0	0.773	Medium brown, slight sulphur odour, no sheen, well in good condition
BH5	7.36	-	-	-	9.28	4.0	-	No sample taken
BH6	3.62	0.754	2.866	4.55	4.95	4.4	1.534	Clear, slight sulphur odour, no sheen, well in good condition
BH7	2.98	0.941	2.039	4.52	4.95	3.7	1.661	Light brown, slight sulphur odour, no sheen, well in good condition
BH8	3.88	-	-	-	6.28	4.0	-	No sample taken
BH9	17.75	15.321	2.429	16.18	18.8	3.0	0.571	No sample taken, well in good condition
BH9A	10.75	8.411	2.339	12.45	16.16	3.0 ²	0.661	Light brown, moderate



Borehole	Top of Casing (mAHD)	Depth to Water (mBTOC)	Ground-water Elevation (mAHD)	Well Total Depth Current (mBTOC)	Well Total Depth 2014 (mBTOC)	Inferred Max GW Elevation (mAHD) ¹	Difference Between Inferred Max and Measured GW Elevation (mAHD)	Comment
								sulphur odour, no sheen, well in good condition
BH10	6.69	-	-	-	5.45	4.9	-	No sample taken
BH11	6.63	1.520	5.11	5.29	5.95	5.5	0.39	Light brown, moderate sulphur odour, no sheen, well in good condition
BH12	8.67	-	-	-	8.39	4.0	-	No sample taken
MW239S	3.04	0.602	2.438	3.86	4.0	3.9	1.462	Light brown, slight sulphur odour, no sheen, well in good condition
MW239D	3.04	-	-	-	20.49	3.9 ³	-	No sample taken
SW01*	N/A	-	N/A	N/A	N/A	N/A	N/A	No sample taken
SW02*	N/A	0.10	N/A	N/A	N/A	N/A	N/A	Natural tannin dark brown, no odour / sheen
SW03*	N/A	-	N/A	N/A	N/A	N/A	N/A	No sample taken
SW04*	N/A	-	N/A	N/A	N/A	N/A	N/A	No sample taken

* Surface water levels representing depth of water as read at time of sampling from an installed measuring tape (when dry number is ground elevation AHD).

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).

N/A – Not applicable

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 at BH1 and BH10. (Table 2).	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 (Table 2) at any on-site bore.	Weekly (or more frequent) monitoring (dipping) of groundwater levels until water level declines to below high	Internal and environmental consultant. Include note in Annual Report.



		frequency level bores listed in Table 2.	
2	Groundwater levels within 0.25 m of <i>inferred</i> maximum historical level (Table 2) 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 (Table 2).	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.

Table 4 provides a summary of the field parameters taken during the March monitoring event. All field parameters for each monitoring location are detailed in the field sheets provided in **Attachment 2**.

Table 4: Summary of Field Measurements

Borehole	Turbidity (NTU)	Temp (°C)	DO (mg/L)	EC (µc/cm)	TDS (mg/L)	PH	Redox (mV)
BH1	ND	ND	ND	ND	ND	ND	ND
BH2	68.83	19.8	5.08	78.7	51	4.68	194.6
BH4	22.06	19.7	4.20	90.8	59	4.93	147.2
BH5	ND	ND	ND	ND	ND	ND	ND
BH6	24.8	23.4	3.19	291	189	3.49	33.4
BH7	11.92	21.8	4.16	164.6	107	3.96	-3.7
BH8	ND	ND	ND	ND	ND	ND	ND
BH9	ND	ND	ND	ND	ND	ND	ND
BH9A	78.06	19.5	2.76	226.2	147	4.44	40.2
BH10	ND	ND	ND	ND	ND	ND	ND
BH11	8.39	20.5	2.57	249.1	162	4.37	-20.4
BH12	ND	ND	ND	ND	ND	ND	ND
MW239S	14.18	21.3	3.01	92.8	60	4.69	-42.4
MW239D	ND	ND	ND	ND	ND	ND	ND
WPW	2865.2	24.1	8.61	224.6	146	4.71	195.6

ND: No Data – no sample taken

Table 5 and **Table 6** below present a summary of the water monitoring results for key analytes found to be elevated above the laboratory limit of reporting (LOR) for groundwater and surface water. **Table 7** presents a summary of the wash plant sampling results for PFAS analytes in water. Recently approved and updated groundwater criteria outlined in the SWMP (7 July 2021) have been applied to this monthly report including a comment on comparison of results with previous data.

Full results summary tables, including quality control sample analyses, are provided in **Tables 1 – 4, Attachment 2**. Based on a review of the QA/QC Compliance Assessment provided by ALS, the overall data quality is



considered acceptable for interpretive use. Copies of the final NATA endorsed laboratory reports, including internal QA/QC results and chain-of-custody documentation for both laboratories are provided in **Attachment 3**.

Table 5: Groundwater Results and Screening Criteria

Analyte	Metals			Discussion of results relative to previous monitoring (details on specific data trends provided in Section 4 below)
	Arsenic	Iron	Manganese	
LOR	0.001	0.05	0.001	
Units	mg/L	mg/L	mg/L	
Adopted Site Specific Trigger Values (SWMP 2021)	0.003	4.1 (8.84 for BH1)	0.136	
Sample ID	Groundwater			
BH1	NS	NS	NS	Metals for BH1 were not analysed - no sample collected.
BH2	<0.001	<0.05	0.010	Metal concentrations were generally consistent with historical results and remain below adopted criteria. BH2 is located marginally down hydraulic gradient from the current quarry operations footprint.
BH4	<0.001	0.09	0.018	Metal concentrations were generally consistent with historical variations and remain below adopted criteria. BH4 is located down hydraulic gradient (approximately 140 m) from current quarry operations and on the southernmost boundary of the site adjacent to Cabbage Tree Road.
BH6	<0.001	0.81	0.002	Generally metal concentrations were consistent with historical results and remain below the adopted criteria. BH6 is considered up hydraulic gradient (approximately 570 m) from current quarry operations and the most north-eastern location at the Site.
BH7	<0.001	0.45	0.003	Metal concentrations were generally consistent with historical results and below adopted criteria. BH7 is located (approximately 630 m) east of the current quarry operations.
BH8	NS	NS	NS	Metals for BH8 were not analysed - no sample collected.
BH9	NS	NS	NS	Metals for BH9 were not analysed - no sample collected.
BH9A	<0.001	0.32	0.036	Metal concentrations were generally consistent with historical results and below adopted criteria. BH9A is down gradient (approximately 50m) from current quarry operations and is on the southernmost boundary of the Site adjacent to Cabbage Tree Road.
BH10	NS	NS	NS	Metals for BH10 were not analysed - no sample collected.
MW239S	<0.001	0.48	0.005	Metal concentrations were generally consistent with historical results and below adopted criteria. MW239S is located approximately 426 m east and upgradient of the current quarry operations.
BH11	<0.001	1.06	0.004	Metal concentrations were generally consistent with historical results and below adopted criteria. BH11 is located approximately 450 m from current quarry operations and at the north-western most point of the Site.
BH12	NS	NS	NS	Metals for BH12 were not analysed - no sample collected.

Notes:

< - Less than laboratory limit of reporting
 NS – No Sample

Table 6: Surface Water Results and Screening Criteria

Analyte	Anions / Nutrients			Metals	Discussion of results relative to previous monitoring (details on specific data trends provided in Section 4 below)
	Total Phosphorus	Ammonia as N	Total Nitrogen as N	Iron	
LOR	0.01	0.01	0.1	0.05	
Units	mg/L	mg/L	mg/L	mg/L	
Site Specific Trigger Values (SWMP 2021)	0.17	0.2	5.9	7.25	
Sample Name	Surface Water				
SW2	<0.01	0.13	0.4	1.62	Iron concentrations detected at SW2 during the March monitoring round (1.62 mg/L) have significantly decreased to below the Site-Specific Trigger Value (7.25 mg/L) following an exceedance reported in February 2022 (15.8 mg/L). Additionally, there were reported exceedances of the adopted criteria for Total Phosphorus, Ammonia as N and Total Nitrogen as N at levels higher than previously reported during the February monitoring event. All analytes have reduced to below the adopted criteria as of March 2022, suggesting the former exceedances were isolated occurrences. SW2 is the most northern located surface water monitoring point and is in close proximity or central to current quarry operations.

Notes:

< - Less than laboratory limit of reporting

Table 7: Wash Plant Water Sample Results and Screening Criteria



Analyte	PFAS				Discussion of results
	PFOA	PFOS	PFHxS	Sum of PFOS + PFHxS	
LOR	0.01	0.01	0.01	0.01	
Units	µg/L	µg/L	µg/L	µg/L	
Site Specific Trigger Values (SWMP 2021)	0.56	N/A	N/A	0.07	
Sample Name	Sand Wash Plant				
WPW	<0.01	0.02	0.01	0.03	PFOA was not detected at this location during the March GME, in line with the previous February 2022 monitoring event. However, the Sum of PFOS + PFHxS was reported above detection limits during the March 2022 (0.03 µg/L) monitoring round at increased concentrations compared to the previous month (0.01 µg/L). Despite the slight increase, concentrations remain below the Site Specific Trigger Value (0.07 µg/L).

Notes:

< - Less than laboratory limit of reporting

3 RAINWATER DATA

Table 8 presents the rainfall data from Williamtown RAAF base (Station Number: 061078, Latitude: 32.79°S; Longitude: 151.84°E; Elevation: 8 m) for the period 2021/22. The total monthly rainfall for March 2022 exceeded the monthly mean by 283%, a rapid increase in comparison to the previous February 2022 rainfall data. Based on current rainfall data (mean and monthly totals) for March 2022, it is expected that groundwater elevations will begin to increase which is consistent with groundwater trend data.

Table 8: 2021-2022 Rainfall data (12-month period)

Date	Apr (21)	May (21)	Jun (21)	July (21)	Aug (21)	Sep (21)	Oct (21)	Nov (21)	Dec (21)	Jan (22)	Feb (22)	Mar (22)
1st	7.8	0	0.2	2.6	0	0	0	0.2	0	0	0	18.2
2nd	0.8	0	0.2	1.6	0.8	0	5.4	0	0.2	0	7.6	25.2
3rd	0	0	0	0	1.6	0	0	0	0	0	13.0	32.2
4th	0.2	0	12.8	0.2	0	0	0	0	0.2	1.0	32.8	55.4
5th	0	6.0	0.8	0	0	3.0	0	4.0	0	7.6	7.2	0.2
6th	0	26.4	0	0	0	0	0	0	0	2.2	4.4	11.6
7th	6.2	31.4	0	0	0	0	0	0	2.8	1.0	1.4	5.4
8th	40.2	0.4	0	0.2	0	0	0	21.0	0.6	10.4	2.0	11.8
9th	0.2	0	7.6	1.4	2.4	0	0	0	10.0	9.2	0.6	68.0
10th	0.2	0.4	0	7.0	0	12.6	0	0.4	0.8	0	0	0.6
11th	0	0	2.0	24.8	0.2	0	23.6	20.2	0	0	0	3.8



Date	Apr (21)	May (21)	Jun (21)	July (21)	Aug (21)	Sep (21)	Oct (21)	Nov (21)	Dec (21)	Jan (22)	Feb (22)	Mar (22)
12th	0	7.2	0	1.0	0	0	10.2	56.8	0	0	39.4	0.6
13th	0	0	0	0	0	0	19.8	0.2	0	0.4	1.0	0.2
14th	0	0	0	0.2	0	0	1.2	0	0	0	0	0
15th	0	0	0	0.4	0.2	0	3.0	0	0	0	0	0.8
16th	0	0	ND	1.2	0	0	0.2	0.2	0.2	5.4	0	0.8
17th	5.0	0	0.4	2.4	0	0	0	0	1.8	0.2	0	0.2
18th	8.6	0	0	0	0.6	0.4	0	0.6	0	0	8.6	0
19th	0.2	0	0.2	0	0	0	0	0	0	32.0	0.2	2.2
20th	0.2	0	26.0	0	0	2.2	3.4	0	0.6	13.2	0	0.4
21st	0	0	19.2	0	0.4	8.8	0.2	5.0	0.2	0.2	0	0
22nd	0	13.0	0.6	0	0	0.4	0.2	27.6	0	0	0	0
23rd	0	0	0.2	0.2	0.2	0	0	9.4	0	0	25.2	0
24th	0	3.0	0.8	0.2	22.2	0	5.4	0.6	0.4	6.8	3.2	35.6
25th	0	0.6	1.8	0	20.2	0	0.2	3.4	0	0	6.0	29.4
26th	0	0.2	0	0	0	0.6	0	31.2	0	0	6.0	14.4
27th	0.2	0	0	0	0	0	0	16.4	0	0	2.6	6.8
28th	0	0	0.4	0	0	0	0	15.8	2.4	0	0.2	0.8
29th	0.2	0	30.8	-	0	0	0	0.8	-	0	-	2.4
30th	0	1.8	0.6	-	0	0	0	0	0.2	0	-	12.2
31st	-	0.4	-	-	0	-	1.6	-	0	0	-	14.8
Total	70.0	90.8	104.6	43.4	48.8	28.0	74.4	213.8	20.4	89.6	161.4	354.0
Historical Mean	109.8	108.6	124.6	72.6	72.8	60.6	75.9	81.9	78.6	99.5	118.3	125.2

Notes:

ND – no data retrieved.

4 DATA TRENDS

Data trends, taken from analyses undertaken throughout the duration of the sampling program (January 2019 – current), are provided as **Attachment 4**. Generally, the trends indicate a steady decrease in groundwater elevations since April 2021. This is likely due to a continuation of decreased rainfall following the March 2021 monitoring event. In more recent months, groundwater elevation has begun to increase since January 2022 in line with increased rainfall. Groundwater levels for the current month appear to be increasing at all locations across the site, with rainfall exceeding the monthly average in both February and March 2022 (as observed in **Section 3**). Based on these trends, groundwater elevations are likely to continue to increase across the quarry.

Notable changes in data trends were observed for the following analytes:

- Iron – Concentrations of iron at SW2 have significantly decreased since the February monitoring round to levels below the adopted criteria. Previously, iron concentrations exceeded both the Site Specific Trigger Value and historical maximum which last occurred in November 2021. It is likely that the February 2022 exceedance was an isolated occurrence, following a return to average conditions during the March 2022 monitoring event.



- Anions & Nutrients – Concentrations of Total Phosphorus, Ammonia as N and Total Nitrogen as N at SW2 have all decreased to below the Site Specific Trigger Value following reported exceedances in February 2022.
- PFAS – The Sum of PFOS + PFHxS was reported above the laboratory limit of reporting in the WPW sample during the March 2022 monitoring round at increased concentrations since the previous monitoring event. Despite this minor increase, concentrations remain below the Site Specific Trigger Value. PFOA was not detected at this location during the March GME, in line with the previous February 2022 monitoring event.

5 CLOSING

Overall, the results suggest that since quarry operations began in August 2019, there has been negligible change in analytical results across the sampled locations.

Based on gauging data at BH2 and BH11, more frequent monitoring of groundwater levels is required until water levels lower to greater than 0.5 m below the inferred maximum groundwater elevation. It is recommended that BH2 and BH11 be gauged on a weekly basis as per the TARP in **Table 3**.

We trust that the above report meets with your requirements. If you have any questions, please do not hesitate to contact the undersigned.

Sincerely,

Kleinfelder Australia Pty Ltd

Megan Ferguson

Environmental Consultant
Contaminated Land Management

MFerguson@kleinfelder.com

Mobile: 0455 981 953

Attachments

Attachment: 1 Figures

Attachment 2: Results tables and field records

Attachment 3: Lab results

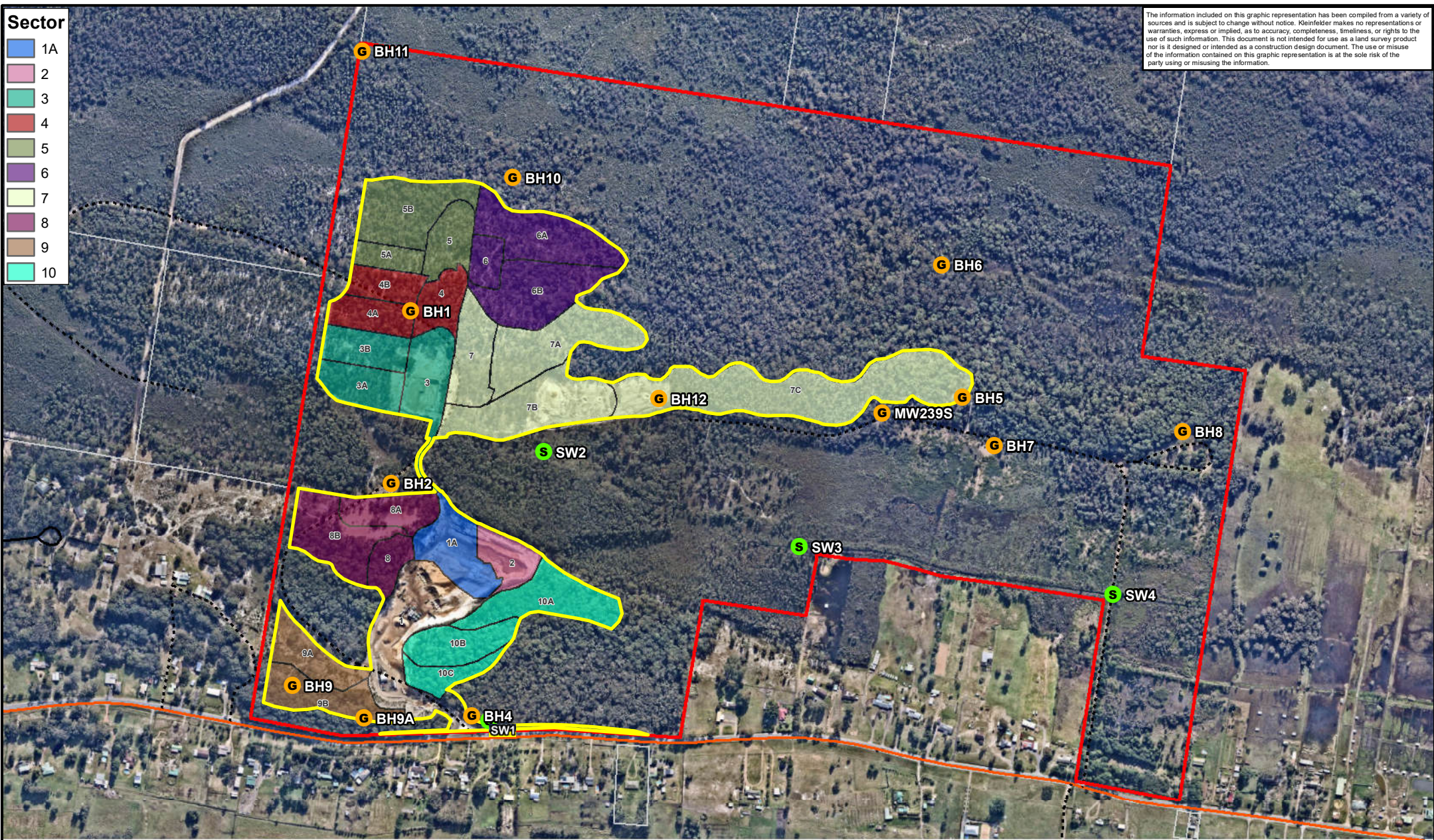
Attachment 4: Data Trends



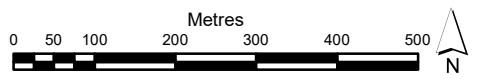
ATTACHMENT 1: FIGURES



The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.



- G Groundwater Sample Site
- S Surface Water Sample Site
- Quarry Project Area
- Subject Land Boundary
- Arterial Road
- Local Road
- Track



PROJECT REFERENCE: 20222347
 DATE DRAWN: 2021/09/03 16:16 Version 1
 DRAWN BY: GJoyce

DATA SOURCE:
 NSW DFS1 - 2017
 Nearmap - 2020

Monthly Monitoring Locations

Williamtown Sand Syndicate
 Proposed Sand Quarry
 Cabbage Tree Road, Williamtown

FIGURE:
1



ATTACHMENT 2: RESULTS TABLES AND FIELD RECORDS



EQUIPMENT CERTIFICATION REPORT

PGN9003871 WATER QUALITY METER – MULTIFUNCTION (YSI)

Plant Number: 1090142

SENSOR	CONCENTRATION	SPAN 1	SPAN 2	TRACEABILITY	PASS
pH	pH 4	pH 4		# 366070	<input checked="" type="checkbox"/>
pH	pH 7	pH 7		# 367754	<input checked="" type="checkbox"/>
Conductivity	12.88 mS/cm	12.88 mS/cm		# 364215	<input checked="" type="checkbox"/>
Dissolved Oxygen	Sodium Sulphite / Air	0.0ppm in Sodium Sulphite	ppm Saturation in Air	# 10640	<input checked="" type="checkbox"/>
ORP	240mV	240mV		# 6393	<input checked="" type="checkbox"/>
Turbidity	100 NTU	100 NTU		# 369011	<input checked="" type="checkbox"/>

Battery Status <u>100</u> (%)	Temperature <u>20.4</u> °C
Electrical Test & Tag (AS/NZS 3760)	Electrodes Cleaned and Checked

Note: Calibration solution traceability information is available upon request.

Please clean/decontaminate instrument and accessories before returning. A minimum 'Cleaning Fee' \$55.00 (Inc GST) may apply if instrument is returned contaminated.

Checked By: Jacob Arnett Date: 10/03/22 Signed: *J Arnett*

Accessories List:

User's Manual	pH and ORP Storage Solution	Transit Case



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HYDRASLEEVE™ SAMPLING LOG

Project Number	Date	Site Address
20222347	17/3/22	Cabbage Tree Rd, Williamstown
Site Name	Field Manager	Weather Observations
WSS	MF	Clear

Well ID	Sample Time	DTW (mbTOC)	Total Depth (mbTOC)	Sample Depth (mbTOC)	Field Measurements							Description (Odour, Colour, Sheen)
					Temp (°C)	DO (mg/L)	EC (µs/cm)	TDS (mg/L)	pH	Redox (mV)	Turbidity (NTU)	
BH2	0830	4.423	8.95		19.8	5.08	78.7	51	4.68	194.6	68.83	light brown, no / ns.
BH4	0800	0.833	6.04		19.7	4.20	90.8	59	4.93	147.2	22.06	medium brown, slight sulfur odour, ns.
BH6	0940	0.754	4.55		23.4	3.19	291	189	3.49	33.4	24.8	clear, slight sulfur odour, ns
BH7	1000	0.941	4.52		21.8	4.16	164.6	107	3.96	-3.7	11.92	light brown, slight sulfur odour, no sheen.
BH9	-	15.321	16.18		-	-	-	-	-	-	-	no sample taken
BH9A	0815	8.411	12.45		19.5	2.76	226.2	147	4.44	40.2	78.06	light brown, moderate sulfur odour, ns.
BH11	0900	1.520	5.29		20.5	2.57	249.1	162	4.37	-20.4	8.39	light brown, mod sulfur odour, ns.
MW29S	0920	0.602	3.86		21.3	3.01	92.8	60	4.69	-42.4	14.18	light brown, slight sulfur odour, ns.
sw2	1015	0.10	-		-	-	-	-	-	-	-	-
wpw	1040	-	-		24.1	8.61	224.6	146	4.71	195.6	2865.2	dark brown, no / ns.

sample

0W80 & 0W81 @ wpw
 0C01 = rinse
 0C02 = trip blank

Table 1
Groundwater Analytical Data - Metals
Williamstown Sand Syndicate



Analyte		Metals		
		Arsenic**	Iron	Manganese**
LOR		0.001	0.05	0.001
Units		mg/L	mg/L	mg/L
Adopted Site Specific Trigger Values (SWMP 2021) ³		0.003	4.1 (8.84 for BH1)	0.136
NHMRC ADWG 2018		0.01	-	0.5
Sample Name	Sample Date			
BH1	21-Feb-19		Blocked	
	15-Mar-19	< 0.001	13	0.014
	23-Apr-19	< 0.001	10	0.015
	16-May-19	< 0.001	8.33	0.009
	14-Jun-19	< 0.001	6.31	0.009
	16-Jul-19	< 0.001	7.35	0.01
	15-Aug-19	< 0.001	7.96	0.008
	16-Sep-19	< 0.001	8.84	0.009
	15-Oct-19	< 0.001	4.32	0.007
	18-Nov-19	< 0.001	11	0.008
	17-Dec-19	< 0.001	8.48	0.009
	16-Jan-20	< 0.001	4.43	0.011
	27-Feb-20	< 0.001	4.1	0.008
	26-Mar-20	< 0.001	7.37	0.009
	27-Apr-20	< 0.001	0.22	0.01
	15-May-20	< 0.001	8.1	0.012
	19-Jun-20	< 0.001	5.74	0.01
	16-Jul-20	< 0.001	6.22	0.01
	14-Aug-20	< 0.001	4.08	0.01
	16-Sep-20	< 0.001	5.48	0.01
	16-Oct-20	< 0.001	5.55	0.009
	16-Nov-20	< 0.001	7.05	0.012
	16-Dec-20	< 0.001	3.21	0.011
	14-Jan-21	< 0.001	5.21	0.013
	16-Feb-21	< 0.001	3.24	0.015
	17-Mar-21	< 0.001	4.0	0.027
22-Apr-21	< 0.001	0.86	0.022	
20-May-21	< 0.001	5.71	0.017	
18-Jun-21	< 0.001	0.52	0.017	
15-Jul-21	< 0.001	0.31	0.02	
24-Feb-22	< 0.001	7.7	0.018	
BH2	22-Feb-19	< 0.001	0.14	0.021
	15-Mar-19	< 0.001	< 0.05	0.02
	23-Apr-19	< 0.001	0.19	0.018
	16-May-19	< 0.001	0.06	0.014
	14-Jun-19	< 0.001	0.08	0.009
	16-Jul-19	< 0.001	0.05	0.013
	15-Aug-19	< 0.001	0.08	0.011
	16-Sep-19	< 0.001	0.26	0.014
	15-Oct-19	< 0.001	0.46	0.011
	18-Nov-19	< 0.001	0.08	0.011
	17-Dec-19	< 0.001	0.1	0.012
	16-Jan-20	< 0.001	0.73	0.014
	27-Feb-20	< 0.001	0.07	0.012
	26-Mar-20	< 0.001	0.06	0.012
	27-Apr-20	< 0.001	< 0.05	0.015
	15-May-20	< 0.001	< 0.05	0.014
	19-Jun-20	< 0.001	0.08	0.014
	16-Jul-20	< 0.001	< 0.5	0.012
	14-Aug-20	< 0.001	0.22	0.015
	16-Sep-20	< 0.001	0.07	0.016
	16-Oct-20	< 0.001	< 0.05	0.015
	16-Nov-20	< 0.001	0.36	0.015
	16-Dec-20	< 0.001	< 0.05	0.014
	14-Jan-21	< 0.001	< 0.05	0.016
	16-Feb-21	< 0.001	< 0.05	0.009
	17-Mar-21	< 0.001	< 0.05	0.016
22-Apr-21	< 0.001	< 0.05	0.008	
20-May-21	< 0.001	< 0.05	0.004	
18-Jun-21	< 0.001	< 0.05	0.011	
15-Jul-21	< 0.001	0.07	0.017	
19-Aug-21	< 0.001	< 0.05	-	
22-Sep-21	< 0.001	< 0.05	0.013	
13-Oct-21	< 0.001	0.08	0.012	
16-Nov-21	< 0.001	< 0.05	-	
15-Dec-21	< 0.001	0.05	0.008	

Table 1
Groundwater Analytical Data - Metals
Williamstown Sand Syndicate



Analyte		Metals		
		Arsenic**	Iron	Manganese**
LOR		0.001	0.05	0.001
Units		mg/L	mg/L	mg/L
Adopted Site Specific Trigger Values (SWMP 2021) ³		0.003	4.1 (8.84 for BH1)	0.136
NHMRC ADWG 2018		0.01	-	0.5
Sample Name	Sample Date			
	18-Jan-22	< 0.001	0.49	0.012
	24-Feb-22	0.002	< 0.05	0.009
	17-Mar-22	< 0.001	< 0.05	0.01
	BH3	21-Feb-19	< 0.001	0.06
BH4	21-Feb-19	< 0.001	0.16	0.039
	15-Mar-19	< 0.001	< 0.05	0.014
	23-Apr-19	< 0.001	0.99	0.045
	16-May-19	< 0.001	0.27	0.022
	14-Jun-19	< 0.001	< 0.05	0.014
	16-Jul-19	< 0.001	< 0.05	0.019
	15-Aug-19	< 0.001	< 0.05	0.018
	16-Sep-19	< 0.001	0.19	0.026
	15-Oct-19	< 0.001	0.31	0.136
	18-Nov-19	< 0.001	< 0.05	0.013
	17-Dec-19	< 0.001	< 0.05	0.014
	16-Jan-20	< 0.001	< 0.05	0.014
	27-Feb-20	< 0.001	0.09	0.013
	26-Mar-20	< 0.001	0.2	0.014
	27-Apr-20	< 0.001	0.22	0.028
	15-May-20	< 0.001	0.13	0.019
	19-Jun-20	< 0.001	0.14	0.016
	16-Jul-20	< 0.001	0.06	0.01
	14-Aug-20	< 0.001	0.09	0.011
	16-Sep-20	< 0.001	0.06	0.012
	16-Oct-20	< 0.001	0.25	0.021
	16-Nov-20	< 0.001	0.18	0.008
	16-Dec-20	< 0.001	0.46	0.027
	14-Jan-21	< 0.001	0.27	0.012
	16-Feb-21	< 0.001	0.94	0.023
	17-Mar-21	< 0.001	1.39	0.029
	22-Apr-21	< 0.001	0.09	0.029
	20-May-21	< 0.001	< 0.05	0.03
	18-Jun-21	< 0.001	< 0.05	0.023
	15-Jul-21	< 0.001	0.08	0.024
	19-Aug-21	< 0.001	0.14	0.022
	22-Sep-21	< 0.001	0.1	0.02
	13-Oct-21	< 0.001	1.65	0.019
	16-Nov-21	< 0.001	0.38	0.021
15-Dec-21	< 0.001	0.69	0.016	
18-Jan-22	< 0.001	0.52	0.018	
24-Feb-22	< 0.001	0.62	0.017	
17-Mar-22	< 0.001	0.09	0.018	
BH5	22-Feb-19	< 0.001	1.4	0.005
	14-Aug-20	< 0.001	0.33	0.003
	24-Feb-22	< 0.001	1.64	0.005
BH6	22-Feb-19	< 0.001	1.03	0.014
	14-Mar-19	< 0.001	1.9	0.01
	23-Apr-19	< 0.001	0.96	0.01
	16-May-19	< 0.001	2.57	0.009
	14-Jun-19	< 0.001	2.86	0.008
	16-Jul-19	< 0.001	2.41	0.008
	15-Aug-19	< 0.001	2.19	0.008
	16-Sep-19	< 0.001	2.08	0.012
	15-Oct-19	< 0.001	1.95	0.009
	18-Nov-19	< 0.001	1.58	0.009
	17-Dec-19	< 0.001	1.78	0.007
	16-Jan-20	< 0.001	2.15	0.01
	27-Feb-20	< 0.001	1.69	0.01
	26-Mar-20	< 0.001	1.51	0.01
	27-Apr-20	< 0.001	1.14	0.014
	15-May-20	< 0.001	1.89	0.01
	19-Jun-20	< 0.001	2.49	0.018
	16-Jul-20	< 0.001	1.98	0.016
	14-Aug-20	< 0.001	2	0.014
	16-Sep-20	< 0.001	1.78	0.01
	16-Oct-20	< 0.001	1.84	0.011

Table 1
Groundwater Analytical Data - Metals
Williamstown Sand Syndicate



Analyte		Metals		
		Arsenic**	Iron	Manganese**
LOR		0.001	0.05	0.001
Units		mg/L	mg/L	mg/L
Adopted Site Specific Trigger Values (SWMP 2021) ³		0.003	4.1 (8.84 for BH1)	0.136
NHMRC ADWG 2018		0.01	-	0.5
Sample Name	Sample Date			
	16-Nov-20	< 0.001	1.72	0.014
	16-Dec-20	< 0.001	1.64	0.014
	14-Jan-21	< 0.001	1.06	0.014
	16-Feb-21	< 0.001	1.18	0.012
	17-Mar-21	< 0.001	1.39	0.012
	22-Apr-21	< 0.001	1.17	0.008
	20-May-21	<0.001	1.05	0.003
	18-Jun-21	<0.001	1.08	0.004
	15-Jul-21	0.002	1.04	0.005
	19-Aug-21	0.005	0.55	0.004
	22-Sep-21	0.002	0.55	0.005
	13-Oct-21	0.002	0.65	0.004
	16-Nov-21	< 0.001	0.83	0.004
	15-Dec-21	< 0.001	0.66	0.002
	18-Jan-22	< 0.001	0.7	0.003
	24-Feb-22	< 0.001	0.55	0.001
	17-Mar-22	< 0.001	0.81	0.002
BH7	22-Feb-19	< 0.001	1.8	0.026
	14-Mar-19	< 0.001	1.8	0.02
	23-Apr-19	< 0.001	2.0	0.026
	16-May-19	< 0.001	2.32	0.035
	14-Jun-19	< 0.001	2.06	0.03
	16-Jul-19	< 0.001	1.66	0.025
	15-Aug-19	< 0.001	1.54	0.023
	16-Sep-19	< 0.001	1.42	0.024
	15-Oct-19	< 0.001	1.32	0.018
	18-Nov-19	< 0.001	1.1	0.015
	17-Dec-19	<0.001	0.98	0.011
	16-Jan-20	<0.001	0.93	0.006
	27-Feb-20	<0.001	1.18	0.008
	26-Mar-20	<0.001	0.9	0.009
	27-Apr-20	<0.001	0.92	0.011
	15-May-20	<0.001	1.26	0.016
	19-Jun-20	<0.001	1.36	0.019
	16-Jul-20	<0.001	1.14	0.02
	14-Aug-20	< 0.001	1.5	0.024
	16-Sep-20	< 0.001	1.67	0.021
	16-Oct-20	< 0.001	1.49	0.015
	16-Nov-20	< 0.001	1.72	0.023
	16-Dec-20	< 0.001	1.79	0.024
	14-Jan-21	< 0.001	1.65	0.025
	16-Feb-21	< 0.001	1.74	0.025
	17-Mar-21	< 0.001	2.28	0.028
	22-Apr-21	< 0.001	1.72	0.023
	20-May-21	<0.001	1.65	0.018
	18-Jun-21	<0.001	1.35	0.011
	15-Jul-21	<0.001	1.15	0.01
19-Aug-21	0.003	0.79	0.006	
22-Sep-21	< 0.001	0.62	0.005	
13-Oct-21	< 0.001	0.69	0.005	
16-Nov-21	< 0.001	0.39	0.003	
15-Dec-21	< 0.001	0.47	0.002	
18-Jan-22	< 0.001	0.45	0.002	
24-Feb-22	< 0.001	0.66	0.003	
17-Mar-22	< 0.001	0.45	0.003	
	21-Feb-19	0.001 *	4.1	0.012
	14-Mar-19	< 0.001	3.25	0.008
	23-Apr-19	0.001	3.2	0.009
	16-May-19	0.003	3.0	0.01
	14-Jun-19	< 0.001	2.5	0.005
	16-Jul-19	0.001	2.6	0.004
	15-Aug-19	0.001	1.72	0.004
	16-Sep-19	0.001	2.06	0.005
	15-Oct-19	< 0.001	2.08	0.009
	18-Nov-19	< 0.001	2.49	0.01
	17-Dec-19	<0.001	3.02	0.011

Table 1
Groundwater Analytical Data - Metals
Williamstown Sand Syndicate



Analyte		Metals		
		Arsenic**	Iron	Manganese**
LOR		0.001	0.05	0.001
Units		mg/L	mg/L	mg/L
Adopted Site Specific Trigger Values (SWMP 2021) ³		0.003	4.1 (8.84 for BH1)	0.136
NHMRC ADWG 2018		0.01	-	0.5
Sample Name	Sample Date			
BH8	16-Jan-20	<0.001	2.94	0.011
	27-Feb-20	<0.001	2.56	0.01
	26-Mar-20	<0.001	3.17	0.012
	27-Apr-20	<0.001	3.32	0.016
	15-May-20	0.001	3.49	0.015
	19-Jun-20	0.001	3.3	0.031
	16-Jul-20	<0.001	2.87	0.006
	14-Aug-20	< 0.001	3.14	0.008
	16-Sep-20	< 0.001	3.35	0.009
	16-Oct-20	0.001	3.03	0.007
	16-Nov-20	< 0.001	3.48	0.008
	16-Dec-20	< 0.001	2.98	0.01
	14-Jan-21	< 0.001	2.71	0.01
	16-Feb-21	0.001	2.99	0.01
	17-Mar-21	< 0.001	3.86	0.01
	22-Apr-21	0.001	2.97	0.01
	20-May-21	0.002	2.36	0.004
	18-Jun-21	<0.001	3.38	0.005
	15-Jul-21	0.001	2.96	0.006
	19-Aug-21	0.003	3.72	-
16-Nov-21	0.001	4.23	-	
16-Dec-21	-	3.78	-	
24-Feb-22	0.001	2.98	0.007	
BH9	14-Aug-20	<0.001	<0.05	0.007
	16-Nov-21	< 0.001	< 0.05	0.014
BH9A	16-Sep-20	< 0.001	0.14	0.076
	16-Oct-20	< 0.001	0.06	0.042
	16-Nov-20	< 0.001	0.11	0.03
	16-Dec-20	< 0.001	0.31	0.024
	14-Jan-21	< 0.001	0.14	0.025
	16-Feb-21	< 0.001	0.35	0.024
	17-Mar-21	< 0.001	0.27	0.024
	22-Apr-21	< 0.001	< 0.05	0.012
	20-May-21	<0.001	<0.05	0.015
	18-Jun-21	<0.001	0.25	0.02
	15-Jul-21	<0.001	0.23	0.023
	19-Aug-21	<0.001	0.26	0.03
	22-Sep-21	< 0.001	0.32	0.027
	13-Oct-21	< 0.001	0.51	0.033
	16-Nov-21	< 0.001	0.33	0.025
	15-Dec-21	< 0.001	0.48	0.025
	18-Jan-22	< 0.001	0.44	0.03
	24-Feb-22	< 0.001	0.5	0.042
17-Mar-22	< 0.001	0.32	0.036	
BH10	21-Feb-19			
	15-Mar-19			
	23-Apr-19			
	16-May-19			
	14-Jun-19			
	16-Jul-19			
	15-Aug-19			
	16-Sep-19			
	15-Oct-19			
	18-Nov-19			
	17-Dec-19			
	16-Jan-20			
	27-Feb-20		Dry	
	26-Mar-20			
	27-Apr-20			
	15-May-20			
	19-Jun-20			
16-Jul-20				
14-Aug-20				
16-Sep-20				
16-Oct-20				
16-Nov-20				

Table 1
Groundwater Analytical Data - Metals
Williamstown Sand Syndicate



Analyte		Metals		
		Arsenic**	Iron	Manganese**
LOR		0.001	0.05	0.001
Units		mg/L	mg/L	mg/L
Adopted Site Specific Trigger Values (SWMP 2021) ³		0.003	4.1 (8.84 for BH1)	0.136
NHMRC ADWG 2018		0.01	-	0.5
Sample Name	Sample Date			
	16-Dec-20			
	14-Jan-21			
	16-Feb-21			
	17-Mar-21			
	22-Apr-21	< 0.001	0.06	0.008
	20-May-21	<0.001	<0.05	0.007
	18-Jun-21	<0.001	<0.05	0.006
	15-Jul-21	<0.001	0.1	0.008
BH11	21-Feb-19	< 0.001	0.26	0.003
	15-Mar-19	< 0.001	1.49	0.007
	23-Apr-19	< 0.001	0.98	0.007
	16-May-19	< 0.001	0.97	0.006
	14-Jun-19	< 0.001	0.98	0.005
	16-Jul-19	< 0.001	0.47	0.003
	15-Aug-19	< 0.001	0.87	0.007
	16-Sep-19	< 0.001	0.79	0.008
	15-Oct-19	< 0.001	0.74	0.006
	18-Nov-19	< 0.001	0.95	0.008
	17-Dec-19	<0.001	1	0.008
	16-Jan-20	<0.001	1.08	0.007
	27-Feb-20	<0.001	0.6	0.003
	26-Mar-20	<0.001	0.36	0.004
	27-Apr-20	<0.001	0.22	0.005
	15-May-20	<0.001	0.78	0.01
	19-Jun-20	<0.001	0.72	0.007
	16-Jul-20	<0.001	1	0.007
	14-Aug-20	<0.001	0.75	0.004
	16-Sep-20	< 0.001	0.9	0.008
	16-Oct-20	< 0.001	1.06	0.009
	16-Nov-20	< 0.001	0.84	0.011
	16-Dec-20	< 0.001	1.0	0.009
	14-Jan-21	< 0.001	0.56	0.006
	16-Feb-21	< 0.001	0.59	0.008
	17-Mar-21	< 0.001	0.2	0.002
	22-Apr-21	< 0.001	0.28	0.002
	20-May-21	<0.001	0.25	<0.001
	18-Jun-21	<0.001	0.25	0.002
	15-Jul-21	<0.001	0.41	0.002
	19-Aug-21	0.001	0.62	0.003
	22-Sep-21	< 0.001	0.72	0.003
13-Oct-21	< 0.001	0.69	0.005	
16-Nov-21	< 0.001	0.92	0.002	
15-Dec-21	< 0.001	0.92	0.003	
18-Jan-22	< 0.001	1.06	0.003	
24-Feb-22	< 0.001	1.25	0.003	
17-Mar-22	< 0.001	1.06	0.004	
BH12	14-Aug-20	< 0.001	0.08	0.008
	16-Sep-20	Hydrasleeves too large for 40mm diameter well casing- no samples taken		
	16-Oct-20	Hydrasleeves too large for 40mm diameter well casing- no samples taken		
	16-Nov-20	< 0.001	-	-
	24-Feb-22	< 0.001	0.33	0.006
	22-Feb-19	< 0.001	1.11	0.003
	14-Mar-19	< 0.001	1.25	0.005
	23-Apr-19	< 0.001	1.01	0.004
	16-May-19	< 0.001	0.87	0.003
	14-Jun-19	< 0.001	0.8	0.003
	16-Jul-19	< 0.001	0.87	0.003
	15-Aug-19	< 0.001	1.0	0.004
	16-Sep-19	< 0.001	0.94	0.006
	15-Oct-19	< 0.001	0.68	0.004
	18-Nov-19	< 0.001	1.1	0.004
	17-Dec-19	<0.001	1.33	0.003
	16-Jan-20	<0.001	1.31	0.004
	27-Feb-20	<0.001	1.03	0.002
26-Mar-20	<0.001	0.97	0.004	
27-Apr-20	<0.001	1.14	0.005	

Table 1
Groundwater Analytical Data - Metals
Williamstown Sand Syndicate



Analyte		Metals		
		Arsenic**	Iron	Manganese**
LOR		0.001	0.05	0.001
Units		mg/L	mg/L	mg/L
Adopted Site Specific Trigger Values (SWMP 2021) ³		0.003	4.1 (8.84 for BH1)	0.136
NHMRC ADWG 2018		0.01	-	0.5
Sample Name	Sample Date			
MW239S	15-May-20	<0.001	1.17	0.004
	19-Jun-20	<0.001	0.9	0.004
	16-Jul-20	<0.001	0.55	0.006
	14-Aug-20	< 0.001	0.38	0.006
	16-Sep-20	< 0.001	0.51	0.008
	16-Oct-20	< 0.001	1.17	0.009
	16-Nov-20	< 0.001	0.3	0.011
	16-Dec-20	< 0.001	1.06	0.011
	14-Jan-21	< 0.001	0.77	0.012
	16-Feb-21	< 0.001	0.92	0.012
	17-Mar-21	< 0.001	0.95	0.01
	22-Apr-21	< 0.001	0.62	0.006
	20-May-21	0.001	0.66	0.003
	18-Jun-21	<0.001	0.68	0.005
	15-Jul-21	<0.001	0.67	0.006
	19-Aug-21	<0.001	0.53	0.006
	22-Sep-21	< 0.001	0.65	0.004
	13-Oct-21	< 0.001	0.79	0.008
	16-Nov-21	< 0.001	0.68	0.006
	15-Dec-21	< 0.001	0.77	0.005
18-Jan-22	< 0.001	0.48	0.003	
24-Feb-22	< 0.001	0.55	0.004	
17-Mar-22	< 0.001	0.48	0.005	
WPW	22-Sep-21	< 0.001	0.08	0.051
	13-Oct-21	< 0.001	0.22	0.079
	16-Nov-21	< 0.001	0.29	0.045
	15-Dec-21	< 0.001	0.2	0.078
	18-Jan-22	< 0.001	0.56	0.038
	24-Feb-22	< 0.001	1.02	0.084
	17-Mar-22	< 0.001	0.97	0.05

Notes:

- - Not analysed
- < - Less than laboratory limit of reporting
- mg/L - Milligrams per litre
- Bold** indicates a detection above the laboratory limit of reporting
- "*" denotes duplicate/triplicate sample result adopted for analytical use due to RPD >50%
- ** denotes 95% Level of protection in freshwater
- RPD - Relative Percentage Difference
- ¹ value for CR VI
- ² as inorganioc
- ³ Soil and Water Management Plan (July 2021)

Table 6
Surface Water Analytical Data - Metals
Williamstown Sand Syndicate



Analyte	Metals																	
	Arsenic**	Barium	Beryllium	Boron**	Cadmium**	Chromium** ¹	Cobalt	Copper**	Iron	Lead**	Manganese**	Mercury** ²	Nickel**	Selenium**	Vanadium	Zinc**		
LOR	0.001	0.001	0.001	0.05	0.0001	0.001	0.001	0.001	0.05	0.001	0.001	0.0001	0.001	0.01	0.01	0.005		
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		
Adopted Site Specific Trigger Values (SWMP 2021) ³	0.006	0.08	0.002	0.1	0.0002	0.004	0.006	0.033	7.25 (32 for SW3 & SW4)	0.003	0.841	0.0001	0.02	0.01	0.01	0.535		
NHMRC ADWG 2018	0.01	-	0.06	4	0.002	0.05	-	2	-	0.01	0.5	0.001	0.02	0.01	-	-		
Sample Name	Sample Date																	
SW2	22-Feb-19																	
	14-Mar-19																	
	23-Apr-19																	
	16-May-19																	
	14-Jun-19																	
	16-Jul-19																	
	15-Aug-19																	
	16-Sep-19																	
	15-Oct-19																	
	18-Nov-19																	
	17-Dec-19																	
	16-Jan-20																	
	27-Feb-20																	
	26-Mar-20																	
	27-Apr-20																	
	15-May-20																	
	19-Jun-20																	
	16-Jul-20																	
	14-Aug-20																	
	16-Sep-20																	
	16-Oct-20																	
	16-Nov-20																	
	16-Dec-20																	
	14-Jan-21																	
	16-Feb-21																	
	17-Mar-21	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	0.001	0.002	< 0.001	0.62	< 0.001	0.11	< 0.0001	0.004	< 0.01	< 0.01	0.097	
	22-Apr-21	0.001	0.005	< 0.001	< 0.05	< 0.0001	0.002	0.001	< 0.001	4.45	< 0.001	0.061	< 0.0001	0.003	< 0.01	< 0.01	0.095	
	20-May-21	0.001	0.002	< 0.001	< 0.05	< 0.0001	0.001	0.002	0.028	1.99	< 0.001	0.016	< 0.0001	0.003	< 0.01	< 0.01	0.038	
18-Jun-21	< 0.001	0.004	< 0.001	< 0.05	0.0001	< 0.001	< 0.001	< 0.001	1.58	< 0.001	0.017	< 0.0001	0.001	< 0.01	< 0.01	0.058		
15-Jul-21	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	< 0.001	0.002	< 0.001	0.39	< 0.001	0.041	< 0.0001	0.002	< 0.01	< 0.01	0.081		
19-Aug-21	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	< 0.001	0.001	< 0.001	0.55	< 0.001	0.045	< 0.0001	0.002	< 0.01	< 0.01	0.022		
22-Sep-21	< 0.001	0.007	< 0.001	< 0.05	< 0.0001	< 0.001	0.003	< 0.001	1.11	< 0.001	0.087	< 0.0001	0.005	< 0.01	< 0.01	0.134		
13-Oct-21	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	< 0.001	0.88	< 0.001	0.049	< 0.0001	0.002	< 0.01	< 0.01	0.06		
16-Nov-21	0.001	0.005	< 0.001	< 0.05	< 0.0001	0.001	0.002	< 0.001	5.59	< 0.001	0.064	< 0.0001	0.004	< 0.01	< 0.01	0.083		
24-Feb-22	< 0.001	0.008	< 0.001	< 0.05	< 0.0001	0.002	0.002	< 0.001	15.8	< 0.001	0.032	< 0.0001	0.006	< 0.01	< 0.01	0.099		
17-Mar-22	-	-	-	-	-	-	-	-	1.62	-	-	-	-	-	-	-		

Notes:
 - - Not analysed
 < - Less than laboratory limit of reporting
 mg/L - Milligrams per litre
Bold indicates a detection above the laboratory limit of reporting
 "**" denotes duplicate/triplicate sample result adopted for analytical use due to RPD >50%
 RPD - Relative Percentage Difference
 ** 95% Level of protection in freshwater
¹ value for CR VI
² as inorganic
³ Soil and Water Management Plan, July 2021

Table 8
Groundwater Analytical Data - Inorganics
Williamstown Sand Syndicate



Analyte	Anions and Cations														Alkalinity					Inorganics			pH								
	Sodium	Calcium	Magnesium	Potassium	Sulphate	Chloride	Fluoride	Reactive phosphorus as P	Total Phosphorus	Nitrite as N	Nitrate as N	Nitrite + Nitrate as N	Ammonia as N	Total Nitrogen as N	Total Kjeldahl Nitrogen as N	Total Cations	Total Anions	Ionic Balance	Sodium Adsorption Ratio	Bicarbonate Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Hydroxide Alkalinity as CaCO3		Total Alkalinity as CaCO3	Total Hardness as CaCO3	Electrical Conductivity @ 25°C*	Total Dissolved Solids	Total Dissolved Solids			
LOR Units	1 mg/L	1 mg/L	1 mg/L	1 mg/L	1 mg/L	1 mg/L	0.1 mg/L	0.01 mg/L	0.01 mg/L	0.01 mg/L	0.01 mg/L	0.01 mg/L	0.1 mg/L	0.1 mg/L	0.01 meq/L	0.01 meq/L	%	0.01	1	1	1	1	1	1	1	10	0.01				
Adopted Site Specific Trigger Values (SWMP 2021) ¹	142	40	52	8	324	234	0.8	-	0.17	-	-	-	0.2	5.9	-	-	-	-	-	-	-	-	-	-	500	-	-	4.2-6.5			
NHMRC ADWG 2018	-	-	-	-	-	-	1.5	-	-	3	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Sample Name	Sample Date																														
SW2	23-Apr-19																														
	16-May-19																														
	14-Jun-19																														
	16-Jul-19																														
	15-Aug-19																														
	16-Sep-19																														
	15-Oct-19																														
	18-Nov-19																														
	27-Feb-20																														
	26-Mar-20																														
	27-Apr-20																														
	15-May-20																														
	19-Jun-20																														
	16-Jul-20																														
	14-Aug-20																														
	16-Sep-20																														
	16-Oct-20																														
	16-Nov-20																														
	16-Dec-20																														
	14-Jan-21																														
16-Feb-21																															
17-Mar-21	12	2.0	2.0	< 1.0	6.0	16	0.2	-	-	-	-	-	-	-	0.79	0.58	-	-	< 1.0	< 1.0	< 1.0	< 1.0	13	83	54	-	5.08				
22-Apr-21	9.0	2.0	1.0	< 1.0	< 10	17	< 0.1	-	-	-	-	-	-	-	0.57	0.58	-	-	5.0	< 1.0	< 1.0	< 1.0	5.0	9.0	86	56	-	4.95			
20-May-21	11	< 1.0	< 1.0	< 1.0	3	15	< 0.1	< 0.01	0.03	< 0.01	< 0.01	< 0.01	< 0.01	0.7	0.48	0.59	-	2.63	1	< 1.0	< 1.0	1	< 1.0	82	53	71	-	4.96			
18-Jun-21	11	< 1.0	2	< 1.0	8	20	< 0.1	-	-	-	-	-	-	-	0.64	0.73	-	-	< 1.0	< 1.0	< 1.0	< 1.0	8	89	58	54	4.51				
15-Jul-21	10	1.0	2.0	< 1.0	7.0	19	< 0.1	-	-	-	-	-	-	-	0.65	0.68	-	-	< 1.0	< 1.0	< 1.0	< 1.0	11	84	55	68	4.66				
19-Aug-21	12	< 1.0	1.0	< 1.0	6.0	22	< 0.1	< 0.01	0.07	< 0.01	< 0.01	< 0.01	0.17	1.2	0.6	0.74	-	2.25	< 1.0	< 1.0	< 1.0	< 1.0	4.0	103	67	-	4.21				
13-Oct-21	10	< 1.0	1.0	< 1.0	6.0	18	< 0.1	< 0.01	0.03	< 0.01	0.02	0.02	< 0.01	0.6	0.52	0.63	-	1.88	< 1.0	< 1.0	< 1.0	< 1.0	4.0	77	50	-	4.7				
24-Feb-22	10	1.0	1.0	< 1.0	2.0	21	0.1	0.63	< 0.01	< 0.01	< 0.01	< 0.01	0.31	7.5	0.57	0.63	-	1.69	< 1.0	< 1.0	< 1.0	< 1.0	7.0	97	63	-	4.32				
17-Mar-22	-	-	-	-	-	-	-	-	< 0.01	-	-	0.04	0.13	0.4	0.4	0.4	-	-	-	-	-	-	-	-	-	-	-	-			

Notes:
 -- Not analysed
 < - Less than laboratory limit of reporting
 LOR - Laboratory limit of reporting
 mg/L - Milligrams per litre
 µS/cm - Microsiemens per centimeter
 Bold indicates a detection above the laboratory limit of reporting
¹ Soil and Water Management Plan, July 2021

Table 2
Wash Plant Water Analytical Data - PFAS
Willamtown Sand Syndicate

Analyte	Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carboxylic Acids										Perfluoroalkyl Sulfonamides						(n:2) Fluorotelomer Sulfonic Acids				Sum of PFAS						
	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)	Perfluorodecanoic acid (PFDA)	Perfluoroundecanoic acid (PFUNDA)	Perfluorododecanoic acid (PFDDA)	Perfluorotridecanoic acid (PFTTrDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctane sulfonamide (FOSA)	N-Methylperfluorooctane sulfonamide (MeFOSA)	N-Ethylperfluorooctane sulfonamide (EtFOSA)	N-Methylperfluorooctane sulfonamide (MeFOSA)	N-Ethylperfluorooctane sulfonamide (EtFOSE)	N-Methylperfluorooctane sulfonamide (MeFOSA)	N-Ethylperfluorooctane sulfonamide (EtFOSA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	Sum of PFAS (WADER List)	Sum of PFAS		
LOR	0.02	0.02	0.02	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.05	0.02	0.05	0.05	0.05	0.05	0.02	0.02	0.05	0.05	0.05	0.05	0.01	0.01	0.01		
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L			
Adopted Site Specific											0.56																	0.07					
HEPA NEMP 2020***					0.13						19																						
HEPA NEMP 2020 [†]											5.6																			0.7			
Sample Name	Sample Date																																
INPUT	22-Sep-21	< 0.02	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.1	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.02	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01
	19-Aug-21	< 0.02	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.1	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.02	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01
	22-Sep-21	< 0.02	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.1	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.02	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01
	13-Oct-21	< 0.02	< 0.02	< 0.02	< 0.02	0.01	< 0.02	< 0.1	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.02	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.01	0.01	0.01
	16-Nov-21	< 0.02	< 0.02	< 0.01	< 0.02	< 0.01	< 0.02	< 0.1	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.02	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01
	15-Dec-21	< 0.02	< 0.02	< 0.01	< 0.02	0.03	< 0.02	< 0.1	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.02	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.03	0.03	0.03
	18-Jan-22	< 0.02	< 0.02	< 0.01	< 0.02	0.03	< 0.02	< 0.1	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.02	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.03	0.03	0.03
	24-Feb-22	< 0.02	< 0.02	0.01	< 0.02	< 0.01	< 0.02	< 0.1	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.02	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.01	0.01	0.01
	17-Mar-22	< 0.02	< 0.02	0.01	< 0.02	0.02	< 0.02	< 0.1	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.02	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.03	0.03	0.03	

Notes:

- Not analysed
- < - Less than laboratory limit of reporting
- µg/L - Micrograms per litre
- *** 95% Level of protection in freshwater - slightly to moderately disturbed systems
- [†] Soil and Water Management Plan July 2021
- [†] Recreation water

Table 3
Quality Control Sample Analysis - Metals
Williamstown Sand Syndicate



Analyte			Metals		
			Arsenic	Iron	Manganese
Units			mg/L	mg/L	mg/L
Sample Name	Sample Date	Sample Type			
TRIP BLANK_13022019	13-Feb-19	Trip Blank	< 0.001	< 0.05	< 0.001
RINSATE01_21022019	21-Feb-19	Rinsate	< 0.001	< 0.05	< 0.001
BH8_21022019	21-Feb-19	Primary	< 0.001	4.1	0.012
DUP01_21022019	21-Feb-19	Duplicate	0.001	4.09	0.012
Relative Percentage Difference			67%	0%	0%
BH8_21022019	21-Feb-19	Primary	< 0.001	4.1	0.012
TRIP01_21022019	21-Feb-19	Triplicate	0.001	4.5	0.012
Relative Percentage Difference			67%	9%	0%
TRIP BLANK_130319	13-Mar-19	Trip Blank	< 0.001	-	< 0.001
TRIP BLANK02_150319	15-Mar-19	Trip Blank	< 0.001	< 0.05	< 0.001
RINSATE02_140319	14-Mar-19	Rinsate	< 0.001	< 0.05	< 0.001
BH7_140319	14-Mar-19	Primary	< 0.001	1.8	0.02
DUP02_140319	14-Mar-19	Duplicate	< 0.001	2.51	0.021
Relative Percentage Difference			NC	33%	5%
BH7_140319	14-Mar-19	Primary	< 0.001	1.8	0.02
TRIP02_14032019	14-Mar-19	Triplicate	< 0.001	1.7	0.019
Relative Percentage Difference			NC	6%	5%
TRIP BLANK_03	23-Apr-19	Trip Blank	< 0.001	< 0.05	< 0.001
RINSATE_03	23-Apr-19	Rinsate	< 0.001	< 0.05	< 0.001
TRIP BLANK_04	16-May-19	Trip Blank	< 0.001	< 0.05	< 0.001
RINSATE_04	16-May-19	Rinsate	< 0.001	< 0.05	< 0.001
TRIP BLANK 05_14062019	14-Jun-19	Trip Blank	< 0.001	< 0.05	< 0.001
RINSATE 05_14062019	14-Jun-19	Rinsate	< 0.001	< 0.05	< 0.001
SW3_14062019	14-Jun-19	Primary	< 0.001	1.68	0.038
DUP05_14062019	14-Jun-19	Duplicate	< 0.001	1.63	0.039
Relative Percentage Difference			NC	3%	3%
SW3_14062019	14-Jun-19	Primary	< 0.001	1.68	0.038
TRIP05_140619	14-Jun-19	Triplicate	< 0.001	1.6	-
Relative Percentage Difference			NC	5%	NC
TRIP BLANK 06_16072019	16-Jul-19	Trip Blank	< 0.001	< 0.05	< 0.001
RINSATE06_16072019	16-Jul-19	Rinsate	< 0.001	< 0.05	< 0.001
RINSATE07	15-Aug-19	Rinsate	< 0.001	< 0.05	< 0.001
TRIP BLANK 08_16092019	16-Sep-19	Trip Blank	< 0.001	< 0.05	< 0.001
RINSATE 08_16092019	16-Sep-19	Rinsate	< 0.001	< 0.05	< 0.001
SW4_16092019	16-Sep-19	Primary	< 0.001	0.7	0.039
DUP08_16092019	16-Sep-19	Duplicate	< 0.001	0.76	0.036
Relative Percentage Difference			NC	8%	8%
SW4_16092019	16-Sep-19	Primary	< 0.001	0.7	0.039
TRIP08_16092019	16-Sep-19	Triplicate	< 0.001	0.69	0.037
Relative Percentage Difference			NC	1%	5%
TRIP BLANK_15102019	15-Oct-19	Trip Blank	< 0.001	-	< 0.001
RINSATE_15102019	15-Oct-19	Rinsate	< 0.001	-	< 0.001
TRIPBLANK09_181119	18-Nov-19	Trip Blank	< 0.001	< 0.05	< 0.001
RINSATE09_181119	18-Nov-19	Rinsate	< 0.001	< 0.05	< 0.001
SW4_181119	18-Nov-19	Primary	< 0.001	6.32	0.032
DUP09_181119	18-Nov-19	Duplicate	< 0.001	5.9	0.036
Relative Percentage Difference			NC	7%	12%
SW4_181119	18-Nov-19	Primary	< 0.001	6.32	0.032
TRIP09_18112019	18-Nov-19	Triplicate	< 0.001	-	0.035
Relative Percentage Difference			NC	NC	9%
TRIPBLANK10_171219	17-Dec-19	Trip Blank	< 0.001	< 0.05	< 0.001
RINSATE10_171219	17-Dec-19	Rinsate	< 0.001	< 0.05	< 0.001
RIP BLANK 13_200133300	16-Jan-20	Trip Blank	< 0.001	< 0.05	< 0.001
RINSATE 13_2001333009	16-Jan-20	Rinsate	< 0.001	< 0.05	< 0.001
BH6_2001333004	16-Jan-20	Primary	<0.001	2.15	0.01
QW12_2001333012	16-Jan-20	Duplicate	<0.001	2.18	0.009
Relative Percentage Difference			NC	1%	11%
BH6_2001333004	16-Jan-20	Primary	<0.001	2.15	0.01
QW13_14392	16-Jan-20	Triplicate	< 0.001	1.6	0.009
Relative Percentage Difference			NC	29%	11%
TRIPBLANK(QW5)	26-Mar-20	Trip Blank	< 0.001	< 0.05	< 0.001
RINSATE (QW4)	26-Mar-20	Rinsate	< 0.001	< 0.05	< 0.001
BH4_ES2010734004	26-Mar-20	Primary	<0.001	0.2	0.014

Table 3
Quality Control Sample Analysis - Metals
Williamstown Sand Syndicate



QW1_ES2010734005	26-Mar-20	Duplicate	<0.001	0.28	0.018
Relative Percentage Difference			NC	33%	13.33%
BH4_ES2010734004	26-Mar-20	Primary	<0.001	0.2	0.014
QW2_S20-Ma47338	26-Mar-20	Triplicate	<0.001	0.27	0.016
Relative Percentage Difference			NC	29.79%	13.33%
TRIPBLANK(QW10)	27-Apr-20	Trip Blank	< 0.001	< 0.05	< 0.001
RINSATE (QW11)	27-Apr-20	Rinsate	< 0.001	< 0.05	< 0.001
BH4_ES2014254004	27-Apr-20	Primary	<0.001	0.22	0.026
QW6_ES2014254005	27-Apr-20	Duplicate	<0.001	0.14	0.018
Relative Percentage Difference			NC	67%	36%
BH4_ES2014254004	27-Apr-20	Primary	<0.001	0.22	-
QW7_S20-Ap44317	27-Apr-20	Triplicate	<0.001	0.22	-
Relative Percentage Difference			NC	NC	-
TRIPBLANK(QW17)	15-May-20	Trip Blank	< 0.001	-	< 0.001
RINSATE (QW16)	15-May-20	Rinsate	< 0.001	< 0.05	0.002
BH4_ES2014254004	15-May-20	Primary	<0.001	0.13	0.019
QW12_ES2014254005	15-May-20	Duplicate	<0.001	0.16	0.023
Relative Percentage Difference			NC	20.70%	19.05%
BH4_ES2016918003	15-May-20	Primary	<0.001	0.13	0.019
QW13_S20-Ap44317	15-May-20	Triplicate	<0.001	-	0.021
Relative Percentage Difference			NC	NC	10%
BH6_ES2010734011	15-May-20	Primary	<0.001	1.89	0.01
QW14_ES2016918014	15-May-20	Duplicate	<0.001	1.73	0.012
Relative Percentage Difference			NC	9%	18%
TRIPBLANK(QW18)	19-Jun-20	Trip Blank	< 0.001	< 0.05	< 0.001
RINSATE (QW19)	19-Jun-20	Rinsate	< 0.001	< 0.05	< 0.001
Rinsate (QW20)	16-Jul-20	Trip Blank	< 0.001	< 0.05	< 0.001
Trip Blank (QW21)	16-Jul-20	Rinsate	< 0.001	< 0.05	< 0.001
TRIPBLANK(QW26)	14-Aug-20	Trip Blank	< 0.001	<0.05	< 0.001
RINSATE (QW27)	14-Aug-20	Rinsate	< 0.001	< 0.05	< 0.001
SW4_ES2028606-012	14-Aug-20	Primary	< 0.001	0.95	0.087
QW22_ES2028606-013	14-Aug-20	Duplicate	<0.001	0.98	0.089
Relative Percentage Difference			NC	3.11%	2%
SW4_ES2028606-012	14-Aug-20	Primary	< 0.001	0.95	0.087
QW23_S20-Au26274	14-Aug-20	Triplicate	0.001	1.1	0.094
Relative Percentage Difference			66%	15%	8%
QW33_160920	16-Sep-20	Trip Blank	< 0.001	< 0.05	< 0.001
QW32_160920	16-Sep-20	Rinsate	< 0.001	< 0.05	< 0.001
SW4_160920	16-Sep-20	Primary	< 0.001	0.97	0.053
QW28_160920	16-Sep-20	Duplicate	< 0.001	0.97	0.054
Relative Percentage Difference			NC	0%	2%
SW4_160920	16-Sep-20	Primary	< 0.001	0.97	0.053
QW29_16092020	16-Sep-20	Triplicate	< 0.001	0.93	0.053
Relative Percentage Difference			NC	4%	0%
QW39_161020	16-Oct-20	Trip Blank	< 0.001	< 0.05	< 0.001
QW38_161020	16-Oct-20	Rinsate	< 0.001	< 0.05	< 0.001
SW4_161020	16-Oct-20	Primary	< 0.001	2.26	0.042
QW34_161020	16-Oct-20	Duplicate	< 0.001	2.32	0.039
Relative Percentage Difference			NC	3%	7%
SW4_161020	16-Oct-20	Primary	< 0.001	2.26	0.042
QW35_16102020	16-Oct-20	Triplicate	< 0.001	2.2	0.045
Relative Percentage Difference			NC	3%	7%
QW39_161120	16-Nov-20	Trip Blank	< 0.001	< 0.05	< 0.001
QW38_161120	16-Nov-20	Rinsate	< 0.001	< 0.05	< 0.001
SW4_161120	16-Nov-20	Primary	< 0.001	1.93	0.074
QW34_161120	16-Nov-20	Duplicate	< 0.001	1.77	0.071
Relative Percentage Difference			NC	9%	4%
SW4_161120	16-Nov-20	Primary	< 0.001	1.93	0.074
QW35_16112020	16-Nov-20	Triplicate	< 0.001	2.2	0.074
Relative Percentage Difference			NC	13%	0%
QW38_161220	16-Dec-20	Rinsate	< 0.001	< 0.05	< 0.001
QW39_161220	16-Dec-20	Trip Blank	< 0.001	< 0.05	< 0.001
SW4_161220	16-Dec-20	Primary	< 0.001	32	0.035
QW34_161220	16-Dec-20	Duplicate	0.001	38	0.035
Relative Percentage Difference			66.67%	17%	0%
SW4_161220	16-Dec-20	Primary	< 0.001	32	0.035
QW35_16122020	16-Dec-20	Triplicate	0.001	34	0.034
Relative Percentage Difference			66.67%	6%	3%

Table 3
Quality Control Sample Analysis - Metals
Williamstown Sand Syndicate



QW39_140121	14-Jan-21	Trip Blank	< 0.001	< 0.05	< 0.001
QW38_140121	14-Jan-21	Rinsate	< 0.001	< 0.05	< 0.001
SW4_140121	14-Jan-21	Primary	0.002	20	0.171
QW34_140121	14-Jan-21	Duplicate	0.001	22	0.176
Relative Percentage Difference			67%	11%	3%
SW4_140121	14-Jan-21	Primary	0.002	20	0.171
QW35_140121	14-Jan-21	Triplicate	0.002	25	0.19
Relative Percentage Difference			0%	22%	11%
QW38_160221	16-Feb-21	Rinsate	< 0.001	< 0.05	< 0.001
QW39_160221	16-Feb-21	Rinsate	< 0.001	< 0.05	< 0.001
SW4_160221	16-Feb-21	Primary	0.003	27	0.054
QW34_160221	16-Feb-21	Duplicate	0.003	27	0.054
Relative Percentage Difference			0%	0%	0%
SW4_160221	16-Feb-21	Primary	0.003	27	0.054
QW35_16022021	16-Feb-21	Triplicate	0.004	32	0.065
Relative Percentage Difference			29%	17%	18%
QW40_170321	17-Mar-21	Trip Blank	< 0.001	< 0.05	< 0.001
QW41_170321	17-Mar-21	Rinsate	< 0.001	< 0.05	< 0.001
QW46_220421	22-Apr-21	Trip Blank	< 0.001	< 0.05	< 0.001
QW47_220421	22-Apr-21	Rinsate	< 0.001	< 0.05	< 0.001
SW4_220421	22-Apr-21	Primary	0.006	34	0.062
QW42_220421	22-Apr-21	Duplicate	0.005	34	0.064
Relative Percentage Difference			18.18%	0%	3%
SW4_220421	22-Apr-21	Primary	0.006	34	0.062
QW43_220421	22-Apr-21	Triplicate	0.006	44	0.074
Relative Percentage Difference			0%	26%	18%
TRIP BLANK MAY_200521	20-May-21	Trip Blank	<0.001	<0.05	<0.001
RINSATE MAY_200521	20-May-21	Rinsate	<0.001	<0.05	<0.001
SW4_200521	20-May-21	Primary	0.002	10.1	0.073
QW51_200521	20-May-21	Duplicate	0.001	9.85	0.083
Relative Percentage Difference			67%	3%	13%
SW4_200521	20-May-21	Primary	0.002	10.1	0.073
QW48_200521	20-May-21	Triplicate	0.001	9.1	0.068
Relative Percentage Difference			67%	10%	7%
Trip Blank June_180621	18-Jun-21	Trip Blank	<0.001	<0.05	<0.001
Rinsate June_180621	18-Jun-21	Rinsate	<0.001	<0.05	<0.001
SW3_180621	18-Jun-21	Primary	0.001	10.5	0.024
QW52_180621	18-Jun-21	Duplicate	<0.001	10.6	0.027
Relative Percentage Difference			67%	1%	12%
SW3_180621	18-Jun-21	Primary	0.001	10.5	0.024
QW53_180621	18-Jun-21	Triplicate	0.002	10	0.024
Relative Percentage Difference			67%	10%	0%
TRIP BLANK JULY_150721	15-Jul-21	Trip Blank	<0.001	<0.05	<0.001
RINSATE JULY_150721	15-Jul-21	Rinsate	<0.001	<0.05	<0.001
SW4_150721	15-Jul-21	Primary	<0.001	1.15	0.044
QW56_150721	15-Jul-21	Duplicate	<0.001	1.13	0.045
Relative Percentage Difference			NC	2%	2%
SW4_150721	15-Jul-21	Primary	<0.001	1.15	0.044
QW57_150721	15-Jul-21	Triplicate	<0.001	0.83	0.043
Relative Percentage Difference			NC	32%	2%
TRIP BLANK AUG_190821	19-Aug-21	Trip Blank	<0.001	<0.05	<0.001
RINSATE AUG_190821	9-Aug-21	Rinsate	<0.001	<0.05	<0.001
SW4_190821	19-Aug-21	Primary	< 0.001	2.13	-
QW60_190821	19-Aug-21	Duplicate	<0.001	2.15	0.048

Table 4
Quality Control Sample Analysis - PFAS
Reference Site Location



Analysis	Sample ID	Sample Type	Collection Date	Perfluorinated Carboxylic Acids																		Perfluorinated Sulfonic Acids							PFAS Totals			Sum of PFAS (ppt)	Date of PFAS							
				Perfluorooctanoic acid (PFOA)	Perfluoroundecanoic acid (PFUA)	Perfluorododecanoic acid (PFDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluorotetradecanoic acid (PF14DA)	Perfluoropentadecanoic acid (PF15DA)	Perfluorohexadecanoic acid (PF16DA)	Perfluorooctadecanoic acid (PF18DA)	Perfluorooctadecanoic acid (PF18DA)	Perfluorooctadecanoic acid (PF18DA)	Perfluorooctadecanoic acid (PF18DA)	Perfluorooctadecanoic acid (PF18DA)	Perfluorooctadecanoic acid (PF18DA)	Perfluorooctadecanoic acid (PF18DA)	Perfluorooctadecanoic acid (PF18DA)	Perfluorooctadecanoic acid (PF18DA)	Perfluorooctadecanoic acid (PF18DA)	Perfluorooctadecanoic acid (PF18DA)	Perfluorooctadecanoic acid (PF18DA)	Perfluorooctadecanoic acid (PF18DA)	PFOS	PFDA	PFTrDA	PF14DA	PF15DA	PF16DA	PF18DA										
PFAS	TSP	15000	Top Bank	PFOA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Table 5
Gauging Data and Field Parameters
Willamtown Sand Syndicate

Date	Borehole	Top of Casing (mAHD)	Depth to Water (mBTOC)	Groundwater Elevation (mAHD)	Well Total Depth at point of sampling (mBTOC)	Time	Temp (°C)	EC (µs/cm)	pH	Redox (mV)	Comment
Mar-19	SW4	2	Dry	-	N/A	-	-	-	-	-	Location was dry.
Apr-19	SW4	2	1.9	1.900	N/A	11:15	17.57	339	3.69	430.5	Water clear, no odour.
May-19	SW4	2	0.135	2.135	N/A	10:30	12.03	389	3.69	211.4	Water clear, no odour.
Jun-19	SW4	N/A	0.175	2.135	N/A	10:45	13.34	313	6.44	377.3	Water clear, no odour.
Jul-19	SW4	N/A	0.281	2.281	N/A	9:30	9.9	371	4.23	116	Light brown, no odour.
Aug-19	SW4	N/A	0.18	2.180	N/A	9:50	8.07	485	4.17	294	Clear, no odour.
Sep-19	SW4	N/A	0.29	2.290	N/A	10:30	14.8	371	4.19	360	Clear, no odour.
Oct-19	SW4	N/A	0.35	2.350	N/A	9:45	16.45	325	4.36	370	Clear, no odour.
Nov-19	SW4	N/A	0.15	2.150	N/A	10:45	18.46	538	4.56	219	Clear, no odour.
Dec-19	SW4	N/A	Dry	-	N/A	-	-	-	-	-	Location was dry
Jan-20	SW4	N/A	Dry	-	N/A	-	-	-	-	-	Location was dry
Feb-20	SW4	N/A	Dry	-	N/A	-	-	-	-	-	Location was dry
Mar-20	SW4	N/A	Dry	-	N/A	-	-	-	-	-	Location was dry
Apr-20	SW4	N/A	0.68	-	N/A	-	16.2	306.1	4.83	205.6	-
May-20	SW4	N/A	1.28	-	N/A	14:00	12.1	337.5	4.69	230.1	-
Jun-20	SW4	N/A	0.38	-	N/A	14:00	12.5	375	4.82	236.2	-
Jul-20	SW4	N/A	0.47	-	N/A	-	13	324	4.7	311	Clear, No odour
Aug-20	SW4	N/A	0.52	-	N/A	-	12.4	433.79	4.22	389	Clear, no odour
Sep-20	SW4	N/A	0.5	-	N/A	-	17.02	383	3.88	389	Clear, no odour
Oct-20	SW4	N/A	0.5	N/A	N/A	-	17.7	397.2	3.62	303	Clear, no odour
Nov-20	SW4	N/A	0.5	N/A	N/A	-	20.3	1239	5.66	256	Clear, slight odour
Dec-20	SW4	N/A	0.5	N/A	N/A	-	21	1397	6.72	-204.6	Natural sheen, no odour
Jan-21	SW4	N/A	0.5	N/A	N/A	-	21.7	1311	7.24	-226.5	Natural sheen, sulphur odour
Feb-21	SW4	N/A	-	-	-	9:45	20.6	1468	6.98	-140.4	Natural sheen, no odour, very full
Mar-21	SW4	N/A	> 0.6	-	-	10:00	19.5	529	7.34	-15.2	Brown/Tan, sulfur odour
Apr-21	SW4	N/A	> 0.6	N/A	N/A	11:21	16.14	257.88	6.18	-65	Brown stain, sulphur odour
May-21	SW4	N/A	1.5	N/A	N/A	10:15	10.4	322	6.26	-54	Natural sheen (brown algae), no odour, water flowing in E direction
Jun-21	SW4	N/A	1.2	N/A	N/A	10:00	10.4	277	4.79	260	Natural tannin brown, no odour / sheen
Jul-21	SW4	N/A	0.65	N/A	N/A	9:55	10.2	247	5.3	152	Natural tannin brown, no odour / sheen, flowing towards eastern boundary
Aug-21	SW4	N/A	0.6	N/A	N/A	9:27	9.4	269	5.13	104	Natural tannin brown (orange algae), no odour / sheen
Sep-21	SW4	N/A	0.6	N/A	N/A	-	12.1	236	5.8	149	Natural tannin orange / yellow, no odour / sheen
Oct-21	SW4	N/A	0.65	N/A	N/A	9:26	15.4	281	6.12	37.1	Dark tannin red / brown, no odour / sheen
Nov-21	SW4	N/A	-	N/A	N/A	10:30	15.9	247.3	5.9	-75.7	Natural tannin orange / brown, no odour, no sheen
Sep-21	WPW	N/A	-	N/A	N/A	-	16.6	284	4.94	318	Dark brown
Oct-21	WPW	N/A	-	N/A	N/A	11:58	18	401.4	4.86	253	Dark brown, no odour / sheen
Nov-21	WPW	N/A	-	N/A	N/A	12:40	21.1	267	4.81	251	Very light brown, no odour, no sheen
Dec-21	WPW	N/A	-	N/A	N/A	10:30	26	273	6.25	-30	light brown, no odour, no sheen
Jan-22	WPW	N/A	-	N/A	N/A	9:50	25.7	26.2	4.7	179	dark brown, no odour/sheen
Mar-22	WPW	N/A	-	N/A	N/A	10:40	24.1	224.6	4.71	195.6	Dark brown, no odour / sheen



ATTACHMENT 3: LAB RESULTS



CERTIFICATE OF ANALYSIS

Work Order : **ES2209497**
Client : **KLEINFELDER AUSTRALIA PTY LTD**
Contact : Megan Ferguson
Address : Suite 3, 240 - 244 Pacific Highway Charlestown
 NSW 2290
Telephone : ----
Project : 20222347
Order number : ----
C-O-C number : ----
Sampler : Megan Ferguson
Site : WSS-Cabbage Tree Rd Water Monitoring March 2022
Quote number : ME/114/19 ALS Compass
No. of samples received : 12
No. of samples analysed : 12

Page : 1 of 9
Laboratory : Environmental Division Sydney
Contact : Shirley LeCornu
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +6138549 9630
Date Samples Received : 17-Mar-2022 11:12
Date Analysis Commenced : 21-Mar-2022
Issue Date : 23-Mar-2022 16:29



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

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

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

- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

				BH2	BH4	BH6	BH7	BH9A
				17-Mar-2022 00:00	17-Mar-2022 00:00	17-Mar-2022 00:00	17-Mar-2022 00:00	17-Mar-2022 00:00
Compound	CAS Number	LOR	Unit	ES2209497-001	ES2209497-002	ES2209497-003	ES2209497-004	ES2209497-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	0.010	0.018	0.002	0.003	0.036
Iron	7439-89-6	0.05	mg/L	<0.05	0.09	0.81	0.45	0.32



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH11	MW239S	SW2	WPW	QW80
Sampling date / time				17-Mar-2022 00:00	17-Mar-2022 00:00	17-Mar-2022 00:00	17-Mar-2022 00:00	17-Mar-2022 00:00	
Compound	CAS Number	LOR	Unit	ES2209497-006	ES2209497-007	ES2209497-008	ES2209497-009	ES2209497-010	
				Result	Result	Result	Result	Result	
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	<0.001	<0.001	
Manganese	7439-96-5	0.001	mg/L	0.004	0.005	----	0.050	0.050	
Iron	7439-89-6	0.05	mg/L	1.06	0.48	1.62	0.97	0.62	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	----	----	0.13	----	----	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	----	----	0.04	----	----	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	----	----	0.4	----	----	
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L	----	----	0.4	----	----	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	----	----	<0.01	----	----	
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	----	----	----	<0.02	<0.02	
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	----	----	----	<0.02	<0.02	
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	----	----	----	0.01	0.01	
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	----	----	----	<0.02	<0.02	
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	----	----	----	0.02	0.02	
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	----	----	----	<0.02	<0.02	
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	----	----	----	<0.1	<0.1	
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	----	----	----	<0.02	<0.02	
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	----	----	----	<0.02	<0.02	
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	----	----	----	<0.02	<0.02	
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	----	----	----	<0.01	<0.01	
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	----	----	----	<0.02	<0.02	
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	----	----	----	<0.02	<0.02	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH11	MW239S	SW2	WPW	QW80
Sampling date / time				17-Mar-2022 00:00	17-Mar-2022 00:00	17-Mar-2022 00:00	17-Mar-2022 00:00	17-Mar-2022 00:00	
Compound	CAS Number	LOR	Unit	ES2209497-006	ES2209497-007	ES2209497-008	ES2209497-009	ES2209497-010	
				Result	Result	Result	Result	Result	
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	----	----	----	<0.02	<0.02	
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	----	----	----	<0.02	<0.02	
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	----	----	----	<0.02	<0.02	
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	----	----	----	<0.05	<0.05	
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	----	----	----	<0.02	<0.02	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	----	----	----	<0.05	<0.05	
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	----	----	----	<0.05	<0.05	
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	----	----	----	<0.05	<0.05	
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	----	----	----	<0.05	<0.05	
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	----	----	----	<0.02	<0.02	
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	----	----	----	<0.02	<0.02	
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	----	----	----	<0.05	<0.05	
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	----	----	----	<0.05	<0.05	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	----	----	----	<0.05	<0.05	
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	----	----	----	<0.05	<0.05	
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L	----	----	----	0.03	0.03	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH11	MW239S	SW2	WPW	QW80
Sampling date / time				17-Mar-2022 00:00	17-Mar-2022 00:00	17-Mar-2022 00:00	17-Mar-2022 00:00	17-Mar-2022 00:00	
Compound	CAS Number	LOR	Unit	ES2209497-006	ES2209497-007	ES2209497-008	ES2209497-009	ES2209497-010	
				Result	Result	Result	Result	Result	
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	----	----	----	0.03	0.03	
Sum of PFAS (WA DER List)	----	0.01	µg/L	----	----	----	0.03	0.03	
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%	----	----	----	113	103	
13C8-PFOA	----	0.02	%	----	----	----	98.9	97.5	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	QC01	QC02	----	----	----
Sampling date / time				17-Mar-2022 00:00	17-Mar-2022 00:00	----	----	----	
Compound	CAS Number	LOR	Unit	ES2209497-011	ES2209497-012	-----	-----	-----	
				Result	Result	----	----	----	
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----	
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	----	----	----	
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	----	----	----	
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	----	----	----	
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	----	----	----	
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	<0.01	----	----	----	
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	----	----	----	
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----	
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----	
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----	
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	----	----	----	
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	----	----	----	
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	----	----	----	
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	----	----	----	
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----	
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----	
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----	
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----	
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----	
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----	
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	QC01	QC02	----	----	----
Sampling date / time				17-Mar-2022 00:00	17-Mar-2022 00:00	----	----	----	
Compound	CAS Number	LOR	Unit	ES2209497-011	ES2209497-012	-----	-----	-----	
				Result	Result	----	----	----	
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----	
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----	
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	----	----	----	
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	----	----	----	
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	----	----	----	
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	----	----	----	
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	----	----	----	
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	----	----	----	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	----	----	----	
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	----	----	----	
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	----	----	----	
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----	
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	----	----	----	
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%	106	96.4	----	----	----	
13C8-PFOA	----	0.02	%	98.6	106	----	----	----	



Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: ES2209497	Page	: 1 of 4
Client	: KLEINFELDER AUSTRALIA PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: Megan Ferguson	Contact	: Shirley LeCornu
Address	: Suite 3, 240 - 244 Pacific Highway Charlestown NSW 2290	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +6138549 9630
Project	: 20222347	Date Samples Received	: 17-Mar-2022
Order number	: ----	Date Analysis Commenced	: 21-Mar-2022
C-O-C number	: ----	Issue Date	: 23-Mar-2022
Sampler	: Megan Ferguson		
Site	: WSS-Cabbage Tree Rd Water Monitoring March 2022		
Quote number	: ME/114/19 ALS Compass		
No. of samples received	: 12		
No. of samples analysed	: 12		



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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4240390)									
ES2209497-001	BH2	EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.010	0.010	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
ES2209553-001	Anonymous	EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.033	0.032	3.2	0% - 20%
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.154	0.158	2.9	0% - 20%
		EG020A-F: Iron	7439-89-6	0.05	mg/L	2.19	2.20	0.5	0% - 20%
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 4238540)									
ES2209473-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.04	0.03	31.7	No Limit
ES2209497-008	SW2	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.13	0.14	0.0	0% - 50%
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4238541)									
ES2209473-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.01	<0.01	0.0	No Limit
ES2209497-008	SW2	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.04	0.04	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 4238545)									
ES2209473-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.0	0.8	19.3	No Limit
ES2209518-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.1	1.1	0.0	0% - 50%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 4238544)									
ES2209473-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.02	<0.01	0.0	No Limit
ES2209518-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	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: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike Concentration	Spike Recovery (%)		Acceptable Limits (%)	
						LCS	Low	High	
EG020F: Dissolved Metals by ICP-MS (QCLot: 4240390)									
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	90.8	85.0	114	
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	89.2	82.0	110	
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	90.9	82.0	112	
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4238540)									
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	104	90.0	114	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4238541)									
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	104	91.0	113	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4238545)									
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	93.1	69.0	101	
				<0.1	1 mg/L	95.7	70.0	118	
				<0.1	5 mg/L	101	70.0	130	
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4238544)									
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	86.9	71.3	126	
				<0.01	0.442 mg/L	87.5	71.3	126	
				<0.01	1 mg/L	98.4	71.3	126	
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4240084)									
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	105	72.0	130	
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	101	71.0	127	
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	0.25 µg/L	102	68.0	131	
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	107	69.0	134	
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	89.4	65.0	140	
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	93.2	53.0	142	
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4240084)									
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	93.7	73.0	129	
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	91.4	72.0	129	
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	118	72.0	129	
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	91.0	72.0	130	
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	100	71.0	133	
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	91.4	69.0	130	
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	102	71.0	129	
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	93.0	69.0	133	
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	107	72.0	134	
EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	81.6	65.0	144	
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	127	71.0	132	



Sub-Matrix: WATER

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike	Spike Recovery (%)		Acceptable Limits (%)	
					Concentration	LCS	Low	High	
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 4240084)									
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	95.6	67.0	137	
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	104	68.0	141	
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	92.0	62.6	147	
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	97.3	66.0	145	
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	99.7	57.6	145	
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	88.2	65.0	136	
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	80.4	61.0	135	
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4240084)									
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	96.2	63.0	143	
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	105	64.0	140	
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	98.0	67.0	138	
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	92.0	71.4	144	

Matrix Spike (MS) Report

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

Sub-Matrix: WATER

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4240390)							
ES2209497-002	BH4	EG020A-F: Arsenic	7440-38-2	1 mg/L	90.2	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	93.2	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4238540)							
ES2209473-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	94.2	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4238541)							
ES2209473-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	89.3	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4238545)							
ES2209473-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	99.1	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4238544)							
ES2209473-002	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	96.6	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES2209497	Page	: 1 of 5
Client	: KLEINFELDER AUSTRALIA PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: Megan Ferguson	Telephone	: +6138549 9630
Project	: 20222347	Date Samples Received	: 17-Mar-2022
Site	: WSS-Cabbage Tree Rd Water Monitoring March 2022	Issue Date	: 23-Mar-2022
Sampler	: Megan Ferguson	No. of samples received	: 12
Order number	: ----	No. of samples analysed	: 12

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		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	19	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	19	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

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

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) BH2, BH6, BH9A, MW239S, WPW, QC01, BH4, BH7, BH11, SW2, QW80, QC02	17-Mar-2022	----	----	----	21-Mar-2022	13-Sep-2022	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G) SW2	17-Mar-2022	----	----	----	21-Mar-2022	14-Apr-2022	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G) SW2	17-Mar-2022	----	----	----	21-Mar-2022	14-Apr-2022	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G) SW2	17-Mar-2022	21-Mar-2022	14-Apr-2022	✓	21-Mar-2022	14-Apr-2022	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G) SW2	17-Mar-2022	21-Mar-2022	14-Apr-2022	✓	21-Mar-2022	14-Apr-2022	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X) WPW, QC01, QW80, QC02	17-Mar-2022	22-Mar-2022	13-Sep-2022	✓	22-Mar-2022	13-Sep-2022	✓



Matrix: **WATER** Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X) WPW, QW80, QC01, QC02	17-Mar-2022	22-Mar-2022	13-Sep-2022	✓	22-Mar-2022	13-Sep-2022	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X) WPW, QW80, QC01, QC02	17-Mar-2022	22-Mar-2022	13-Sep-2022	✓	22-Mar-2022	13-Sep-2022	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X) WPW, QW80, QC01, QC02	17-Mar-2022	22-Mar-2022	13-Sep-2022	✓	22-Mar-2022	13-Sep-2022	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X) WPW, QW80, QC01, QC02	17-Mar-2022	22-Mar-2022	13-Sep-2022	✓	22-Mar-2022	13-Sep-2022	✓



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	Method	Count		Rate (%)			Quality Control Specification
		QC	Reaular	Actual	Expected	Evaluation	
Analytical Methods							
Laboratory Duplicates (DUP)							
Ammonia as N by Discrete analyser	EK055G	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	19	0.00	10.00	✘	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	20	15.00	15.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	20	15.00	15.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	19	0.00	5.00	✘	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
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.
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



Client: Kleinfelder Australia Pty Ltd Suite 3, 240-244 Pacific Hwy Charlestown, NSW 2290 Phone: 02 4949 5200		SITE: COC AND CONTACT DATA WSS - Cabbage Tree Rd Water Monitoring March 2022 Date: 17/03/2022 Time: 11:15 Location: 48 hrs Duration: 3 days Frequency: 5 days Total: 7 days P/N: 20222347 Contact email: mferguson@kleinfelder.com P/N email:	
CHAIN OF CUSTODY Relinquished by (sign): <i>Megan Ferguson</i> Date/Time: 17/3/22 11:15 Temp (°C): Notes:		Received by (sign): <i>[Signature]</i> Date/Time: 17/3/22 11:15 Temp (°C): Notes:	
Relinquished by (sign): Date/Time: Temp (°C): Notes:		Received by (sign): Date/Time: Temp (°C): Notes:	

Sample ID	Lab ID	Sample Point	Sample Type	Date	Start Depth	End Depth	Units	# Containers	W-04 SG TRH SG/BTEX	Organic Analyses			Metals			Other Analyses			Comments
										Relinquished (sign)	Date/Time	Notes	W-03 Metals NEPM 15	Iron (dissolved)	3 Metals (As, Ba, Cr, Cu, Fe, Mg, Ni and Zn)	3 metals only (As, Fe & Mn)	Iron	Total Phosphorus, Ammonia as N, Total Nitrogen as N	
BH2			Water	17/03/2022				1											
BH4			Water	17/03/2022				1											
BH6			Water	17/03/2022				1											
BH7			Water	17/03/2022				1											
BH9A			Water	17/03/2022				1											
BH11			Water	17/03/2022				1											
MM239S			Water	17/03/2022				1											
SW2			Water	17/03/2022				2											
WPVW			Water	17/03/2022				3											
QW80			Water	17/03/2022				3											
QW81			Water	17/03/2022				3											
QC01			Water	17/03/2022				3											
QC02			Water	17/03/2022				3											

LAB OF ORIGIN:
NEWCASTLE

Environmental Division
 Sydney
 Work Order Reference
ES2209497



Telephone: +61-2-8764 9555

W-03 Metals (NEPM 15) - As, Ba, Bo, B, Cd, Cr, Co, Cu, Fe, Pb, Ph, Mn, Hg, Ni, Se, V, Zn
 NT14 - Extended water suite B

Kleinfelder Australia Pty Ltd (NEWC)
Suite 3, 240-244 Pacific Hwy
Charlestown
NSW 2290



NATA Accredited
Accreditation Number 1261
Site Number 20794

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

Attention: **M Ferguson**

Report **874230-W**
Project name **WSS - CABBAGE TREE RD WATER MONITORING MARCH 2022**
Project ID **20222347**
Received Date **Mar 21, 2022**

Client Sample ID			QW81
Sample Matrix			Water
Eurofins Sample No.			S22-Ma52356
Date Sampled			Mar 17, 2022
Test/Reference	LOR	Unit	
Heavy Metals			
Arsenic (filtered)	0.001	mg/L	< 0.001
Iron (filtered)	0.05	mg/L	1.0
Manganese (filtered)	0.005	mg/L	0.051
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA) ^{N11}	0.05	ug/L	< 0.05
Perfluoropentanoic acid (PFPeA) ^{N11}	0.01	ug/L	< 0.01
Perfluorohexanoic acid (PFHxA) ^{N11}	0.01	ug/L	< 0.01
Perfluoroheptanoic acid (PFHpA) ^{N11}	0.01	ug/L	< 0.01
Perfluorooctanoic acid (PFOA) ^{N11}	0.01	ug/L	< 0.01
Perfluorononanoic acid (PFNA) ^{N11}	0.01	ug/L	< 0.01
Perfluorodecanoic acid (PFDA) ^{N11}	0.01	ug/L	< 0.01
Perfluoroundecanoic acid (PFUnDA) ^{N11}	0.01	ug/L	< 0.01
Perfluorododecanoic acid (PFDoDA) ^{N11}	0.01	ug/L	< 0.01
Perfluorotridecanoic acid (PFTTrDA) ^{N15}	0.01	ug/L	< 0.01
Perfluorotetradecanoic acid (PFTTeDA) ^{N11}	0.01	ug/L	< 0.01
13C4-PFBA (surr.)	1	%	61
13C5-PFPeA (surr.)	1	%	80
13C5-PFHxA (surr.)	1	%	98
13C4-PFHpA (surr.)	1	%	107
13C8-PFOA (surr.)	1	%	114
13C5-PFNA (surr.)	1	%	119
13C6-PFDA (surr.)	1	%	103
13C2-PFUnDA (surr.)	1	%	105
13C2-PFDoDA (surr.)	1	%	112
13C2-PFTTeDA (surr.)	1	%	83
Perfluoroalkyl sulfonamido substances			
Perfluorooctane sulfonamide (FOSA) ^{N11}	0.05	ug/L	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	0.05	ug/L	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	0.05	ug/L	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE) ^{N11}	0.05	ug/L	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE) ^{N11}	0.05	ug/L	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	0.05	ug/L	< 0.05

Client Sample ID			QW81
Sample Matrix			Water
Eurofins Sample No.			S22-Ma52356
Date Sampled			Mar 17, 2022
Test/Reference	LOR	Unit	
Perfluoroalkyl sulfonamido substances			
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	0.05	ug/L	< 0.05
13C8-FOSA (surr.)	1	%	58
D3-N-MeFOSA (surr.)	1	%	88
D5-N-EtFOSA (surr.)	1	%	108
D7-N-MeFOSE (surr.)	1	%	41
D9-N-EtFOSE (surr.)	1	%	35
D5-N-EtFOSAA (surr.)	1	%	44
D3-N-MeFOSAA (surr.)	1	%	33
Perfluoroalkyl sulfonic acids (PFASs)			
Perfluorobutanesulfonic acid (PFBS) ^{N11}	0.01	ug/L	< 0.01
Perfluorononanesulfonic acid (PFNS) ^{N15}	0.01	ug/L	< 0.01
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	0.01	ug/L	< 0.01
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	0.01	ug/L	< 0.01
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	0.01	ug/L	< 0.01
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	0.01	ug/L	< 0.01
Perfluorooctanesulfonic acid (PFOS) ^{N11}	0.01	ug/L	< 0.01
Perfluorodecanesulfonic acid (PFDS) ^{N15}	0.01	ug/L	< 0.01
13C3-PFBS (surr.)	1	%	130
18O2-PFHxS (surr.)	1	%	131
13C8-PFOS (surr.)	1	%	112
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA) ^{N11}	0.05	ug/L	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	0.01	ug/L	< 0.01
13C2-4:2 FTSA (surr.)	1	%	74
13C2-6:2 FTSA (surr.)	1	%	156
13C2-8:2 FTSA (surr.)	1	%	119
13C2-10:2 FTSA (surr.)	1	%	75
PFASs Summations			
Sum (PFHxS + PFOS)*	0.01	ug/L	< 0.01
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	< 0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	< 0.01
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	< 0.05
Sum of PFASs (n=30)*	0.1	ug/L	< 0.1

Sample History

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

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

Description	Testing Site	Extracted	Holding Time
Heavy Metals (filtered) - Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS	Sydney	Mar 30, 2022	180 Days
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Brisbane	Mar 28, 2022	28 Days
Perfluoroalkyl sulfonamido substances - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Brisbane	Mar 28, 2022	28 Days
Perfluoroalkyl sulfonic acids (PFSAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Brisbane	Mar 28, 2022	28 Days
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Brisbane	Mar 28, 2022	28 Days

Company Name:	Kleinfelder Aust Pty Ltd (NEWCASTLE)	Order No.:		Received:	Mar 21, 2022 7:52 PM
Address:	Suite 3, 240-244 Pacific Hwy Charlestown NSW 2290	Report #:	874230	Due:	Mar 29, 2022
Project Name:	WSS - CABBAGE TREE RD WATER MONITORING MARCH 2022	Phone:	02 4949 5200	Priority:	5 Day
Project ID:	20222347	Fax:		Contact Name:	M Ferguson

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Arsenic	Iron	Manganese	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254									
Sydney Laboratory - NATA # 1261 Site # 18217						X	X	X	
Brisbane Laboratory - NATA # 1261 Site # 20794									X
Mayfield Laboratory - NATA # 1261 Site # 25079									
Perth Laboratory - NATA # 2377 Site # 2370									
External Laboratory									
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID				
1	QW81	Mar 17, 2022		Water	S22-Ma52356	X	X	X	X
Test Counts						1	1	1	1

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

Units

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

Terms

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

QC - Acceptance Criteria

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

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

Results <10 times the LOR: No Limit

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

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

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

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

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
Method Blank						
Heavy Metals						
Arsenic (filtered)	mg/L	< 0.001		0.001	Pass	
Iron (filtered)	mg/L	< 0.05		0.05	Pass	
Manganese (filtered)	mg/L	< 0.005		0.005	Pass	
Method Blank						
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05		0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01		0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01		0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01		0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01		0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01		0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01		0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01		0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01		0.01	Pass	
Perfluorotridecanoic acid (PFTTrDA)	ug/L	< 0.01		0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01		0.01	Pass	
Method Blank						
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05		0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05		0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05		0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05		0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05		0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05		0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05		0.05	Pass	
Method Blank						
Perfluoroalkyl sulfonic acids (PFsAs)						
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01		0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01		0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01		0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01		0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01		0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01		0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01		0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01		0.01	Pass	
Method Blank						
n:2 Fluorotelomer sulfonic acids (n:2 FTsAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01		0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05		0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01		0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01		0.01	Pass	
LCS - % Recovery						
Heavy Metals						
Arsenic (filtered)	%	101		80-120	Pass	
Iron (filtered)	%	98		80-120	Pass	
Manganese (filtered)	%	97		80-120	Pass	
LCS - % Recovery						
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)	%	77		50-150	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code	
Perfluoropentanoic acid (PFPeA)	%	78			50-150	Pass		
Perfluorohexanoic acid (PFHxA)	%	79			50-150	Pass		
Perfluoroheptanoic acid (PFHpA)	%	78			50-150	Pass		
Perfluorooctanoic acid (PFOA)	%	78			50-150	Pass		
Perfluorononanoic acid (PFNA)	%	80			50-150	Pass		
Perfluorodecanoic acid (PFDA)	%	75			50-150	Pass		
Perfluoroundecanoic acid (PFUnDA)	%	82			50-150	Pass		
Perfluorododecanoic acid (PFDoDA)	%	82			50-150	Pass		
Perfluorotridecanoic acid (PFTrDA)	%	51			50-150	Pass		
Perfluorotetradecanoic acid (PFTeDA)	%	76			50-150	Pass		
LCS - % Recovery								
Perfluoroalkyl sulfonamido substances								
Perfluorooctane sulfonamide (FOSA)	%	81			50-150	Pass		
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	77			50-150	Pass		
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	70			50-150	Pass		
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	76			50-150	Pass		
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	74			50-150	Pass		
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	81			50-150	Pass		
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	71			50-150	Pass		
LCS - % Recovery								
Perfluoroalkyl sulfonic acids (PFSAs)								
Perfluorobutanesulfonic acid (PFBS)	%	78			50-150	Pass		
Perfluorononanesulfonic acid (PFNS)	%	69			50-150	Pass		
Perfluoropropanesulfonic acid (PFPrS)	%	79			50-150	Pass		
Perfluoropentanesulfonic acid (PFPeS)	%	70			50-150	Pass		
Perfluorohexanesulfonic acid (PFHxS)	%	76			50-150	Pass		
Perfluoroheptanesulfonic acid (PFHpS)	%	89			50-150	Pass		
Perfluorooctanesulfonic acid (PFOS)	%	77			50-150	Pass		
Perfluorodecanesulfonic acid (PFDS)	%	68			50-150	Pass		
LCS - % Recovery								
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)								
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	77			50-150	Pass		
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	80			50-150	Pass		
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	73			50-150	Pass		
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	73			50-150	Pass		
Test	Lab Sample ID	QA Source	Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery								
Heavy Metals				Result 1				
Arsenic (filtered)	S22-Ma52356	CP	%	96		75-125	Pass	
Iron (filtered)	S22-Ma52356	CP	%	82		75-125	Pass	
Manganese (filtered)	S22-Ma52356	CP	%	89		75-125	Pass	
Spike - % Recovery								
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1				
Perfluorobutanoic acid (PFBA)	L22-Ma53281	NCP	%	80		50-150	Pass	
Perfluoropentanoic acid (PFPeA)	L22-Ma53281	NCP	%	86		50-150	Pass	
Perfluorohexanoic acid (PFHxA)	L22-Ma53281	NCP	%	90		50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	L22-Ma53281	NCP	%	81		50-150	Pass	
Perfluorooctanoic acid (PFOA)	L22-Ma53281	NCP	%	86		50-150	Pass	
Perfluorononanoic acid (PFNA)	L22-Ma53281	NCP	%	89		50-150	Pass	
Perfluorodecanoic acid (PFDA)	L22-Ma53281	NCP	%	91		50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	L22-Ma53281	NCP	%	104		50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	L22-Ma53281	NCP	%	100		50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorotridecanoic acid (PFTrDA)	L22-Ma53281	NCP	%	70			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	L22-Ma53281	NCP	%	122			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	L22-Ma53281	NCP	%	103			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	L22-Ma53281	NCP	%	103			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	L22-Ma53281	NCP	%	100			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	L22-Ma53281	NCP	%	112			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	L22-Ma53281	NCP	%	116			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	L22-Ma53281	NCP	%	107			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	L22-Ma53281	NCP	%	96			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSA)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	L22-Ma53281	NCP	%	84			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	L22-Ma53281	NCP	%	65			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	L22-Ma53281	NCP	%	84			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	L22-Ma53281	NCP	%	75			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	L22-Ma53281	NCP	%	79			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	L22-Ma53281	NCP	%	86			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	L22-Ma53281	NCP	%	86			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	L22-Ma53281	NCP	%	54			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	L22-Ma53281	NCP	%	82			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	L22-Ma53281	NCP	%	81			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	L22-Ma53281	NCP	%	90			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	L22-Ma53281	NCP	%	97			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic (filtered)	S22-Ma55981	NCP	mg/L	0.003	0.004	9.0	30%	Pass	
Iron (filtered)	S22-Ma55981	NCP	mg/L	1.1	1.1	2.0	30%	Pass	
Manganese (filtered)	S22-Ma55981	NCP	mg/L	0.21	0.20	1.0	30%	Pass	

Duplicate								
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD		
Perfluorobutanoic acid (PFBA)	N22-Ma56979	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
Perfluoropentanoic acid (PFPeA)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorohexanoic acid (PFHxA)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoroheptanoic acid (PFHpA)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorooctanoic acid (PFOA)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorononanoic acid (PFNA)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorodecanoic acid (PFDA)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoroundecanoic acid (PFUnDA)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorododecanoic acid (PFDoDA)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorotridecanoic acid (PFTrDA)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorotetradecanoic acid (PFTeDA)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
Perfluorooctane sulfonamide (FOSA)	N22-Ma56979	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	N22-Ma56979	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	N22-Ma56979	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	N22-Ma56979	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	N22-Ma56979	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	N22-Ma56979	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	N22-Ma56979	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1	Result 2	RPD		
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	N22-Ma56979	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	N22-Ma56979	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass

Comments
Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised by:

Andrew Black	Analytical Services Manager
Gabriele Cordero	Senior Analyst (NSW)
Sarah McCallion	Senior Analyst (NSW)



Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

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

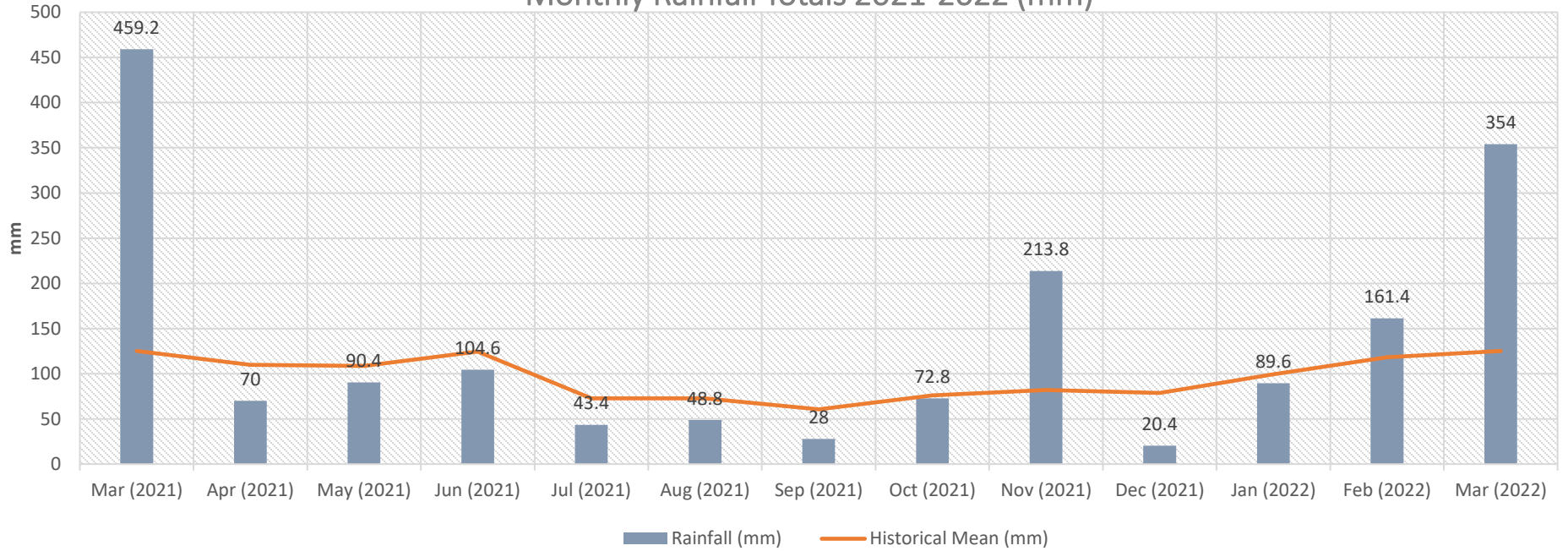
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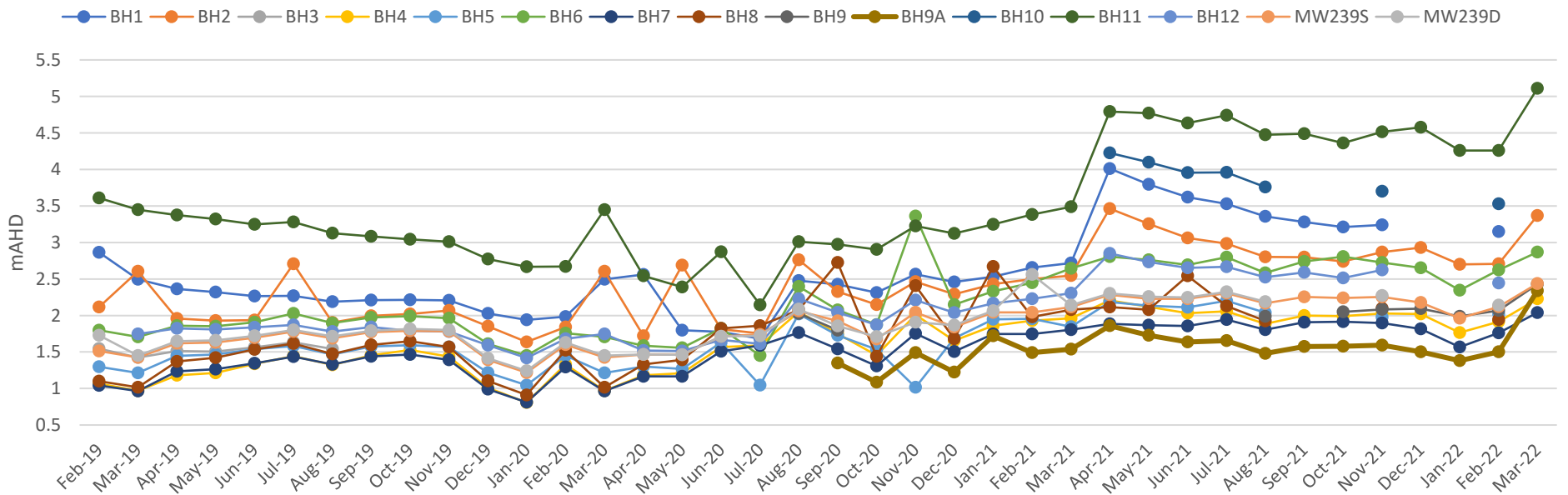
ATTACHMENT 4: DATA TRENDS



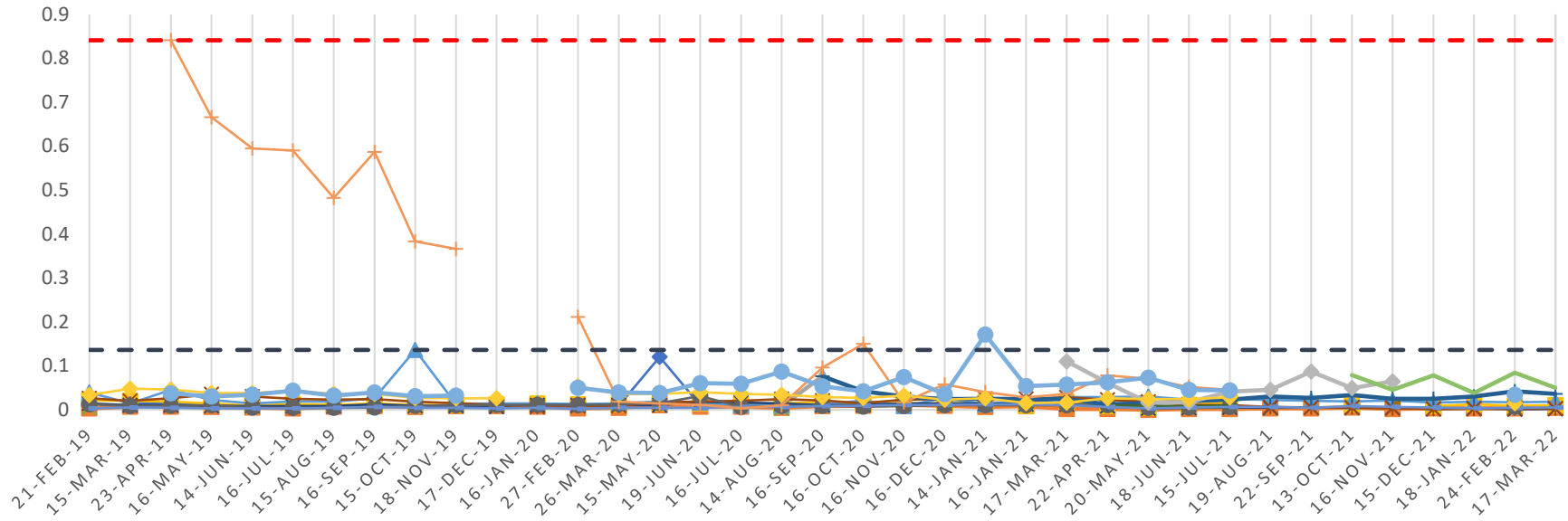
Monthly Rainfall Totals 2021-2022 (mm)



Groundwater Elevation (mAHD)



Manganese (Mn) mg/L



pH (Field)

