

# Monthly water quality monitoring results

## Cabbage Tree Road sand quarry

### March 2021 Water Monitoring Event

NCA21R124493

12 April 2021



Williamtown Sand Syndicate  
PO Box 898  
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#### **Attention: Darren Williams**

**Subject:** Monthly water quality monitoring results  
Cabbage Tree Road sand quarry  
March 2021 Water Monitoring Event

Please find enclosed the monthly water monitoring results at Cabbage Tree Road Sand Quarry for the March 2021 water monitoring event

## **1 SCOPE OF SERVICE**

The scope of work includes the quarterly surface and groundwater monitoring as part of the monthly monitoring requirements. **Figure 1 (Attachment 1)** presents the surface water and groundwater sampling locations.

The scheduled March monitoring was a monthly monitoring event to include gauging of all available monitoring wells (a total of 14 wells) and sampling from 11 monitoring wells and four surface water locations.

## **2 SITE WORK**

The monthly monitoring round was conducted on 17 March 2021.

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 the 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. Following gauging, each HydraSleeves was removed and samples taken.

The March 2021 monitoring round included:

- Gauging of 14 monitoring wells (BH1, BH2, BH4, BH5, BH6, BH7, BH8, BH9, BH9A, BH10, BH11, BH12, MW239S & MW239D);
- Groundwater sampling from 10 monitoring wells as summarised in **Table 5** and detailed in **Attachment 2** (noting BH10 was dry at the time of sampling); and
- Surface water sampling from three locations as summarised in **Table 5** and detailed in **Attachment 2** (noting SW2 was dry at the time of sampling)

Water samples were collected into laboratory supplied containers and placed into an ice chilled esky. The samples were 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**

Analysis	Number of Samples				
	Primary	Intra-lab (Duplicate)	Inter-lab (Triplicate)	Transport Blank	Rinsate Blank
Hydrocarbons*	13	1	1	1	1
Metals**	12	1	1	1	1
Iron (dissolved)	12	1	1	1	1
General Water Quality Suite***	12	0	0	0	0
Total Dissolved Solids (TDS)	12	0	0	0	0



Analysis	Number of Samples				
	Primary	Intra-lab (Duplicate)	Inter-lab (Triplicate)	Transport Blank	Rinsate Blank
Total Suspended Solids (TSS)	12	0	0	0	0
PFAS (28 analytes, standard level)	10	2	2	1	1

\* TRH (C6 – C40) (Silica Gel), BTEXN

\*\* NEPM Metals Suite (dissolved) - Arsenic (As), Barium (Ba), Beryllium (Be), Boron (B), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Iron (Fe), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), Selenium (Se), Vanadium (V), Zinc (Zn).

\*\*\* General Water Quality Suite - Ca, Mg, Na, K, pH, EC, Cl, SO<sub>4</sub>, Alkalinity, Fluoride, Hardness & TDS (Calc')

### 3 SAMPLING RESULTS

**Table 2** provides a summary of the gauging data. The full set of gauging data and field parameters for each monitoring location are provided in **Attachment 2**. Additionally, Watershed HydroGeo (2019) outlined a Trigger Action and Response Plan (TARP) to mitigate groundwater elevations that would potentially impact quarry operations at Williamtown Sand (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)	Groundwater Elevation (mAHD)	Well Total Depth Current (mBTOC)	Well Total Depth 2014 (mBTOC)	Inferred Max GW Level (mAHD) <sup>1</sup>	Comment
BH1	8.64	5.923	2.717	8.41	9.45	4.5	Clear, no odour
BH2	7.79	5.244	2.546	8.80	9.45	3.8	Cloudy brown, no odour
BH3	-	-	-	-	-	3.4	Well decommissioned
BH4	3.06	1.098	1.962	5.93	6.45	3.0	Light Brown, sulphur odour
BH5	7.36	5.516	1.844	8.65	9.28	4.0	No sample taken
BH6	3.62	0.977	2.643	4.42	4.95	4.4	Clear, sulphur odour
BH7	2.98	1.174	1.806	4.42	4.95	3.7	Clear, sulphur odour.
BH8	3.88	1.801	2.079	6.04	6.28	4.0	Light brown, sulphur odour
BH9	-	-	-	-	-	3.0	Well decommissioned
BH9A	10.25	8.713	1.537	12.50	16.16	3.0 <sup>2</sup>	Dark brown, sulphur odour
BH10	6.69	Dry	-	3.63	5.45	4.9	Well was dry.
BH11	6.63	3.143	3.487	5.21	5.95	5.5	Clear, no odour



BH12	8.67	6.364	2.306	8.19	8.39	4.0	Clear, no odour
MW239S	3.04	0.923	2.117	3.83	4.0	3.9	Cloudy brown, sulphur odour
MW239D	3.04	0.901	2.139	20.49	20.49	3.9 <sup>3</sup> -	No sample taken
SW01*	N/A	>0.6	N/A	N/A	N/A	N/A	Slight brown stain, sulphur odour
SW02*	N/A	0.1	N/A	N/A	N/A	N/A	Slight brown stain, sulphur odour
SW03*	N/A	>0.6	N/A	N/A	N/A	N/A	Slight brown stain, sulphur odour
SW04*	N/A	>0.6	N/A	N/A	N/A	N/A	Brown stain, sulphur odour

\* Surface water levels measured from measuring tape installed (When dry number is ground elevation AHD).

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

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

<sup>3</sup> – 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 to
<b>0</b>	Groundwater levels more than 0.5 m below <i>inferred</i> maximum historical level at BH1 and BH10. ( <b>Table 2</b> ).	Standard operations – monthly dipping of operational on-site monitoring bores.	n/a
<b>1</b>	Groundwater levels within 0.5 m below <i>inferred</i> maximum historical level ( <b>Table 2</b> ) at any on-site bore.	Weekly (or more frequent) monitoring (dipping) of groundwater levels until water level declines to below high frequency level bores listed in <b>Table 2</b> .	Internal and environmental consultant. Include note in Annual Report.
<b>2</b>	Groundwater levels within 0.25 m of <i>inferred</i> maximum historical level ( <b>Table 2</b> ) at any on-site bore.	Weekly (or more frequent) monitoring (dipping) of groundwater levels. Re-analysis and review of MEL.	WSS to issue letter to DPIE, documenting groundwater level and rainfall trends, and review and recommendations regarding of Minimum Extraction Level (MEL) outlined in Watershed HydroGeo, 2019.
<b>3</b>	Groundwater levels within resource area rise above previously <i>inferred</i> maximum groundwater level ( <b>Table 2</b> ).	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, Dol 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 gauging data and field parameters for each monitoring location are 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	175	21.0	3.76	152	97	5.84	-18
BH2	1503	21.4	6.5	114	70	5.62	140
BH4	172	20.7	3.21	5.80	377	5.90	-170
BH5	ND	ND	ND	ND	ND	ND	ND
BH6	191	22.9	2.85	495	324	5.23	-172
BH7	89	22.8	4.73	350	226	5.1	-137
BH8	349	21.3	6.23	366	238	5.02	-159
BH9A	1030	20.4	2.81	214	138	5.72	-161
BH11	411	20.8	2.85	291	188	5.43	-95
BH12	159	20.6	3.72	211	135	5.77	-186
MW239S	673	22.3	2.63	402	260	5.19	-158
SW01	0	21.1	5.38	184	120	6.39	118
SW02	0.1	20.3	3.93	132	83	6.16	244
SW03	0	20.6	3.22	291	190	6.54	107.6
SW04	26.9	19.5	3.33	529	341	7.34	-15.2

ND: No Data – no sample taken

**Table 5** and **Table 6** presents a summary of the water monitoring results for key analytes found to be elevated above the LOR for groundwater and surface water. Groundwater and surface water criteria outlined in the baseline water quality summary (BWQS) report, developed by Kleinfelder (KLF 2020), has been applied to the monthly report including a comment comparing results with previous data. It should be noted that since undertaking the BWQS report increased rainfall has occurred throughout 2020 (compared to 2019) which may influence baseline concentrations across the site, most notably in metals, inorganics and general water quality parameters.

Non detect for analytes BTEXN, TRH, TPH and PFAS were reported at the majority of locations and are therefore not included in the below summary tables with exception to SW4 which reported concentrations of PFOS above the Baseline Trigger Values and is therefore included in the summary table (**Table 6**). Full results tables are provided in the **Attachment 2**. Full Laboratory results, including copies of the COC are provided in **Attachment 3**.



**Table 5: Groundwater screening levels**

Analyte	Metals								Relative to previous monitoring (details on specific data trends provided in Section 5 below)
	Barium	Chromium**1	Copper**	Cobalt	Iron	Manganese**	Nickel	Zinc**	
LOR	0.001	0.001	0.001	0.001	0.05	0.001	0.001	0.005	
Units	mg/L	mg/L	mg/L	Mg/L	mg/L	mg/L	mg/L	mg/L	
Baseline Trigger Values (KLF 2020)	0.035	0.004	0.013 (0.051 for BH4)	-	4.1 <sup>2</sup> / 1.0 <sup>3</sup>	1.9	0.022 (0.037 for BH11)	0.085	
NHMRC ADWG (2018)	-	0.05	2	-	-	0.5	0.02	-	
Sample ID	Groundwater								
BH1	0.004	0.002	<0.001	<0.001	4.0 <sup>4</sup>	0.027	<0.001	0.596	Concentrations of metals were generally consistent with historical results and below adopted criteria. Iron concentrations (4.0 mg/L) are within historical variations and will continue to be closely monitored during subsequent monthly monitoring rounds to confirm trends. BH1 is up hydraulic gradient of current quarry operations. Zinc was identified above the baseline trigger values but within the historical range.
BH11	0.01	0.001	<0.001	<0.001	0.2	0.002	0.003	0.014	



Analyte	Metals								Relative to previous monitoring (details on specific data trends provided in Section 5 below)
	Barium	Chromium** <sup>1</sup>	Copper**	Cobalt	Iron	Manganese**	Nickel	Zinc**	
LOR	0.001	0.001	0.001	0.001	0.05	0.001	0.001	0.005	
Units	mg/L	mg/L	mg/L	Mg/L	mg/L	mg/L	mg/L	mg/L	
Baseline Trigger Values (KLF 2020)	0.035	0.004	0.013 (0.051 for BH4)	-	4.1 <sup>2</sup> / 1.0 <sup>3</sup>	1.9	0.022 (0.037 for BH11)	0.085	
NHMRC ADWG (2018)	-	0.05	2	-	-	0.5	0.02	-	
Sample ID	Groundwater								
									noting, concentrations from the February monitoring round were detected above the Baseline Trigger Value.
BH12	NS	NS	NS	NS	NS	NS	NS	NS	Metals for BH12 were not analysed.
BH2	0.005	0.001	0.003	<0.001	<0.05	0.016	<0.001	0.006	Metal concentration were generally consistent with historical results and remain below adopted criteria. BH2 is down hydraulic gradient from the current quarry operations footprint.
BH4	0.027	<0.001	0.006	<0.001	1.39	0.029	0.002	0.019	Metal concentration were generally consistent with historical results and remain below adopted criteria. BH4 is down hydraulic gradient from current quarry operations and on the southernmost boundary of the site.



Analyte	Metals								Relative to previous monitoring (details on specific data trends provided in Section 5 below)
	Barium	Chromium**1	Copper**	Cobalt	Iron	Manganese**	Nickel	Zinc**	
LOR	0.001	0.001	0.001	0.001	0.05	0.001	0.001	0.005	
Units	mg/L	mg/L	mg/L	Mg/L	mg/L	mg/L	mg/L	mg/L	
Baseline Trigger Values (KLF 2020)	0.035	0.004	0.013 (0.051 for BH4)	-	4.1 <sup>2</sup> / 1.0 <sup>3</sup>	1.9	0.022 (0.037 for BH11)	0.085	
NHMRC ADWG (2018)	-	0.05	2	-	-	0.5	0.02	-	
Sample ID	Groundwater								
BH6	0.068	<0.001	<0.001	<0.001	1.39	0.012	<0.001	0.006	Generally metal concentrations were consistent with historical results. Barium concentrations (0.068 mg/L) remain elevated above the Baseline Trigger Values (0.035mg/L) although within the historical range. Increased metal concentrations are most likely a result of above average rainfall in the region. Concentrations will continue to be closely monitored during subsequent monthly monitoring rounds to confirm trends. BH6 is generally up hydraulic gradient from current quarry operations and at the north eastern most point of the Site.
BH7	0.009	0.002	<0.001	0.003	2.28	0.028	0.005	<0.005	Metal concentrations were generally consistent with historical



Analyte	Metals								Relative to previous monitoring (details on specific data trends provided in Section 5 below)
	Barium	Chromium** <sup>1</sup>	Copper**	Cobalt	Iron	Manganese**	Nickel	Zinc**	
LOR	0.001	0.001	0.001	0.001	0.05	0.001	0.001	0.005	
Units	mg/L	mg/L	mg/L	Mg/L	mg/L	mg/L	mg/L	mg/L	
Baseline Trigger Values (KLF 2020)	0.035	0.004	0.013 (0.051 for BH4)	-	4.1 <sup>2</sup> / 1.0 <sup>3</sup>	1.9	0.022 (0.037 for BH11)	0.085	
NHMRC ADWG (2018)	-	0.05	2	-	-	0.5	0.02	-	
Sample ID	Groundwater								
									results and below adopted criteria. BH7 is located east of the current quarry operations.
BH8	0.012	0.001	<0.001	<0.001	3.86	0.01	0.002	<0.005	Metal concentrations were consistent with historical results and below adopted criteria. BH8 is located to the east of the current quarry operations on the eastern most boundary of the Site.
BH9A	0.006	<0.001	<0.001	<0.001	0.27	0.024	0.002	0.01	Metal concentrations were generally consistent with historical results and below adopted criteria. BH9A is down gradient for current quarry operations and is on the southernmost boundary of the Site.
MW239S	0.011	0.002	<0.001	<0.001	0.95	0.01	0.004	0.009	Metal concentrations were generally consistent with historical results and below



Analyte	Metals								Relative to previous monitoring (details on specific data trends provided in Section 5 below)
	Barium	Chromium** <sup>1</sup>	Copper**	Cobalt	Iron	Manganese**	Nickel	Zinc**	
LOR	0.001	0.001	0.001	0.001	0.05	0.001	0.001	0.005	
Units	mg/L	mg/L	mg/L	Mg/L	mg/L	mg/L	mg/L	mg/L	
Baseline Trigger Values (KLF 2020)	0.035	0.004	0.013 (0.051 for BH4)	-	4.1 <sup>2</sup> / 1.0 <sup>3</sup>	1.9	0.022 (0.037 for BH11)	0.085	
NHMRC ADWG (2018)	-	0.05	2	-	-	0.5	0.02	-	
Sample ID	Groundwater								
									adopted criteria. MW239S is located east of the current quarry operations.

Notes:

< - Less than laboratory limit of reporting

\*\* 95% Level of protection in freshwater

<sup>1</sup> value for CR VI

<sup>2</sup> Northern half of site – BH6, BH7, BH8, BH11 & MW239S

<sup>3</sup> Southern half of site - BH2, BH4 & BH9

<sup>4</sup> BH1, BH5 & BH12 – Baseline Trigger Values do not apply. Data assessed against historical variations (since monitoring began in February 2019).

NS – No Sample



**Table 6: Surface water screening levels**

Analyte	Metals										PFAS	Relative to previous monitoring (details on specific data trends provided in Section 5 below)		
	Arsenic	Barium	Chromium** <sup>1</sup>	Copper**	Cobalt	Iron	Manganese**	Nickel	Zinc**	PFOS				
LOR	0.001	0.001	0.001	0.001	0.001	0.05	0.001	0.001	0.005	0.01				
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L				
Baseline Trigger Values (KLF 2020)	0.001	0.08	0.002	0.013	0.017	9.26	0.841 (SW1)/0.048 (SW3 & SW4)	0.022	0.535 (SW1) / 0.085 (SW3 & SW4)	0.01 <sup>2</sup>				
NHMRC ADWG 6	0.01	-	0.05	2	-	-	0.5	0.02	-	-				
Sample Name	Surface Water													
SW1	<0.001	0.013	<0.001	<0.001	<0.001	0.16	0.036	<0.001	0.04	<0.01	Metal concentrations were generally consistent with historical variations. SW1 is located on the southernmost boundary adjacent to Cabbage Tree Road.			
SW2	<0.001	0.005	0.001	<0.001	0.002	0.62	0.11	0.004	0.097	<0.01	SW2 was previously dry during all sampling periods from 2019 – February 2021. Metal concentrations detected in SW2 collected from March were all below the Baseline Trigger Values (KLF, 2020).			
SW3	0.004	0.013	<0.001	<0.001	0.002	12	0.016	0.003	0.007	<0.01	Metal concentrations are generally consistent with historical data. Concentrations of Arsenic (0.004 mg/L) are marginally above the baseline trigger values (0.001 mg/L) however, based on the trend data arsenic concentrations appear to be increasing at this location. Concentrations of Iron were above the Baseline Trigger Value (9.26mg/L) however, within the historical range for this location. Concentrations will continue to be closely monitored during subsequent monthly monitoring rounds to confirm trends. SW3 is located within a drainage channel that travels from west to east along the south eastern perimeter of the			



Analyte	Metals										PFAS	Relative to previous monitoring (details on specific data trends provided in Section 5 below)
	Arsenic	Barium	Chromium** <sup>1</sup>	Copper**	Cobalt	Iron	Manganese**	Nickel	Zinc**	PFOS		
LOR	0.001	0.001	0.001	0.001	0.001	0.05	0.001	0.001	0.005	0.01		
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L		
Baseline Trigger Values (KLF 2020)	0.001	0.08	0.002	0.013	0.017	9.26	0.841 (SW1)/0.048 (SW3 & SW4)	0.022	0.535 (SW1) / 0.085 (SW3 & SW4)	0.01 <sup>2</sup>		
NHMRC ADWG 6	0.01	-	0.05	2	-	-	0.5	0.02	-	-		
Sample Name	Surface Water											
												Site. SW3 is east of the current quarry operations.
SW4	0.002	0.02	0.002	<0.001	<0.001	16	0.057	<0.001	<0.005	0.02		Metal concentrations at SW4 appear to be generally stable across most analytes with exception to iron which reported a decrease in concentrations compared to the previous months results. Arsenic concentrations were detected at this location for the third consecutive month, indicating a potential increasing trend at this location, noting SW4 is downstream of SW3. Detections of heavy metals above the baseline trigger values is likely due to above average rainfall in the region. Concentrations will continue to be closely monitored during subsequent monthly monitoring rounds to confirm trends. PFOS (0.04 µg/L) and PFHxs (0.03 µg/L) was reported above criteria for the third month in a row.

Notes:

< - Less than laboratory limit of reporting

\*\* 95% Level of protection in freshwater

<sup>1</sup> value for CR VI

<sup>2</sup> HEPA NEMP 2018 – Recreational Water



## 4 RAINWATER DATA

**Table 7** 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 2020/21. The mean monthly rainfall for the month of February/March period indicates that there was an above average rainfall for March.

**Table 7: 2020-2021 Rainfall data**

2020	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan (21)	Feb (21)	Mar (21)
1st	0	6.4	0	0	0	0	0.4	0.2	0	7.0	0.2	0
2nd	0.2	0	0	0.2	0	0	0	3.2	12	21.2	17.2	0
3rd	9.2	0	0.6	0	0	0	0	0	0	2.2	4.2	0
4th	12.4	0	0.2	1.6	0	0	0	0	0	0.2	0.2	1.6
5th	4.2	5.6	0	0	0	3	0	0	0	41.6	0	0
6th	0	5.6	0	0	0	0	0	30.2	12	0	0	3.8
7th	0	0.2	0	0	0	0	0	0	0	5.8	10.6	0.8
8th	0	0	0.4	4	3	0	0	0.4	0	4.0	0.2	0
9th	0.8	0	26.8	0	2.8	0	0	0	0	12.0	0.4	6.4
10th	0	0	14	0	8.4	12.6	0	0	0	0.2	4.4	0.8
11th	4	0	11.4	0.6	18.4	0	0	0	1	0	0.6	0
12th	0	0	1.4	1.8	0	0	0	0	0	0	0	0
13th	0	0	0.2	17	1.2	0	0	4.4	0	0	3.4	7.6
14th	0	0.2	11.2	24.6	0	0	0	13.6	0	0	11	1.8
15th	0	9.2	0	4	5	0	0	0	5.4	0.2	0.2	39.2
16th	0	3.4	0	0	0	0	0	0	14.8	0	11	1.0
17th	0	0	0	0	0	0	0	5.8	0	0	3.6	6.0
18th	0	6.2	4.2	7.8	0	0.4	0.2	0	13.6	0	0.2	43.6
19th	0	2.2	0	0	0	0	18.0	0	8.0	0	29.2	96.4
20th	0	0.2	0	0	0	2.2	1.0	0	5.0	0	0.4	79.2
21st	0	0.8	0.4	0	0	8.8	0	0	3.0	0	7.4	46.6
22nd	0	12	10.2	0	0	0.4	0	0	48.6	0	20.6	65.2
23rd	0	0.2	0.2	0	0	0	0	0	0.2	0	19.8	16.8
24th	0	0.2	0	0	0	0	9.4	0	0	0	9.2	4.4
25th	0	0	0	0	0	0	14.0	0.4	0	0	3.6	0.2
26th	0	38.8	0	23.4	0	0.6	128.8	0	0	0	0	0
27th	17.2	0	0.2	133	0	0	76.2	0	1.8	0	0	0
28th	4.6	0	0	16.2	0	0	0	0	0.2	50.6	0.2	0
29th	1	1.6	0	8.4	0	0	4.0	0	24.0	31.4		31.4
30th	0	12.6	0.2	0	0	0	0	0	0.2	6		2.4
31st	-	0.2	-	0	0	-	-	-	6.4	4.4		4.0



2020	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan (21)	Feb (21)	Mar (21)
Total	53.6	105.6	70.4	242.6	38.8	28	252.0	58.2	156.2	186.8	157.8	459.2
Mean	109.8	108.6	124.6	72.6	72.8	60.6	75.9	81.9	77.5	98.3	118.3	125.2

## 5 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 an increase in groundwater elevation across the site, this is considered to be in line with the increased rainfall observed in Section 4 however has not increased above levels identified at the commencement of monitoring.

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

- Arsenic – Arsenic concentrations generally remained stable across the Site with the exception of SW3 and SW4 where arsenic was detected above the baseline trigger value, consistent with January and February monitoring rounds. Trend data suggests an increasing trend of arsenic at these locations, noting that SW4 is downstream of SW3.
- Iron – generally remained stable across the site with elevated concentrations at SW4 previously identified in the February monitoring round decreasing.
- Barium –concentrations of barium remain generally consistent across the site, however BH6 concentration levels remain elevated above the Baseline Trigger Value however, concentrations detected in the March 2021 monitoring round were within the historical range.
- Nickel – concentrations of nickel are generally within historical variations.
- Cobalt – concentrations of cobalt are generally within historical variations.
- Copper – concentrations of copper were less than the Baseline Trigger Value for all surface water and groundwater locations, with data trends appearing to decrease across the Site in comparison to January and February 2021 monitoring rounds.
- Calcium – generally calcium concentrations across the site have remained stable or marginally decreased.
- Zinc – concentration of zinc are generally within historical variations
- PFAS – Concentrations of PFAS were detected in the March 2021 monitoring event at levels within the same order of magnitude as previously detected in January 2021 and February 2021. The principle PFAS compounds detected were PFOS and PFHxS.

## 6 CLOSING

Overall, the results suggest that since quarry operations began in August 2019 there has been minimal change in analytical results.

It is recommended that further investigation be undertaken in the area of SW3 and SW4 to determine if there is a potential issue with increasing arsenic concentrations. The following should be undertaken:

- A review of rainfall data in comparison to other months to understand if an increase in rainfall may be a reason for increased concentrations
- A description of current operations in relation to the location of SW3 along with surface water movements across the site.
- Discussion with current operation staff to understand the work that has been undertaken in the last 4 months to determine for the potential introduction of arsenic sources and / or the potential mobilisation of naturally occurring arsenic due to the quarry operations (a comparison of sand analysis including leachability from the area would help to prove or dis-prove this).



We trust the information presented is acceptable. If you have any questions, please do not hesitate in contacting the undersigned.

Sincerely,

**Kleinfelder Australia Pty Ltd**

**Daniel Kousbroek**

Environmental Consultant  
Contaminated Land Management  
[dkousbroek@kleinfelder.com](mailto:dkousbroek@kleinfelder.com)  
Mobile: 0458 197 676

### Attachments

- Attachment: 1 Figures
- Attachment 2: Results tables and field records
- Attachment 3: Lab results
- Attachment 4: Data Trends

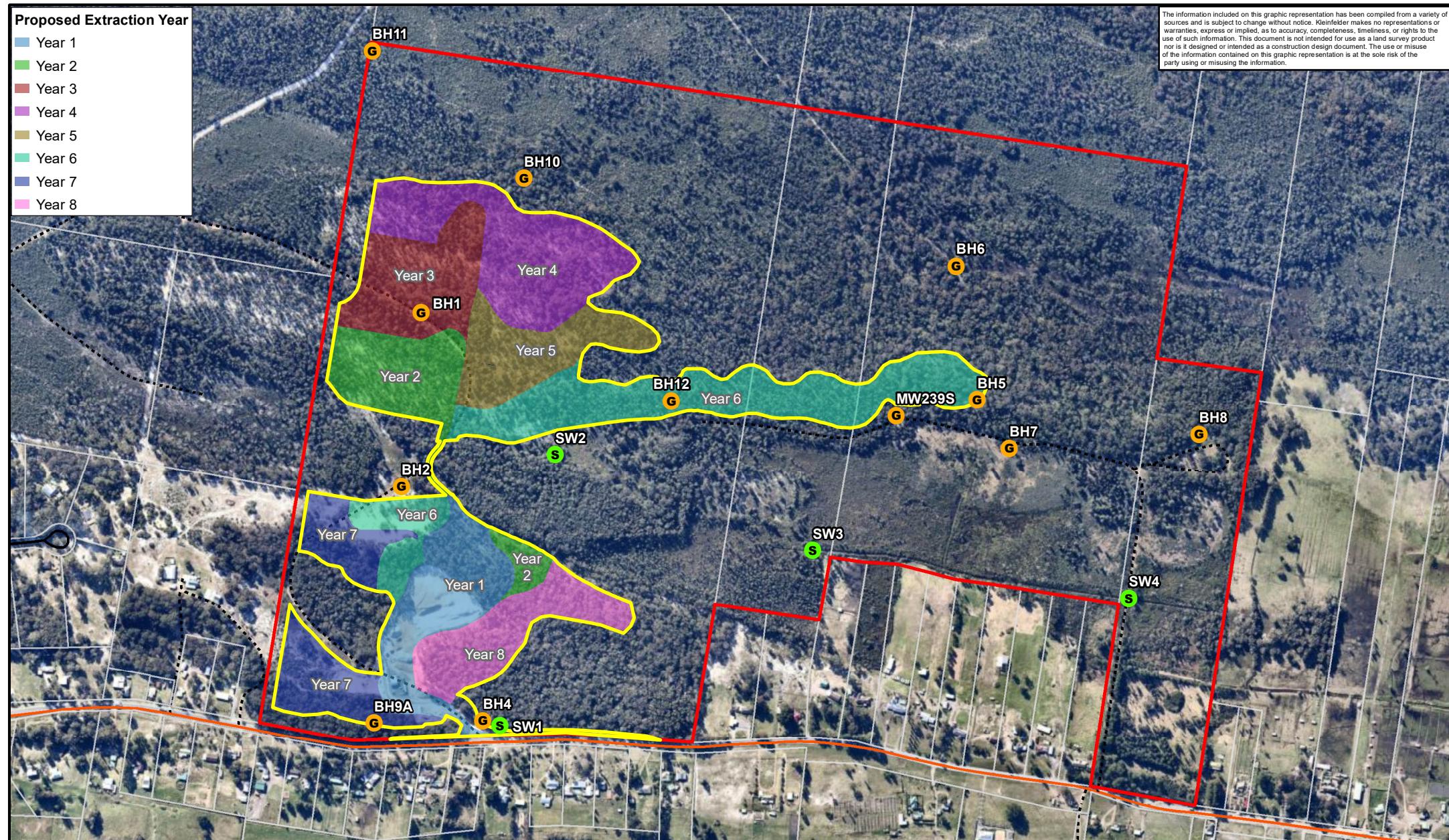


## ATTACHMENT 1: FIGURES



### Proposed Extraction Year

- Year 1
- Year 2
- Year 3
- Year 4
- Year 5
- Year 6
- Year 7
- Year 8



(G) Groundwater Sample Site (S) Surface Water Sample Site

— Arterial Road  
— Local Road

■ Quarry Project Area

■ Subject Land Boundary

— Track



PROJECT REFERENCE: 20170448

DATE DRAWN: 2021/03/02 22:40 Version 1

DRAWN BY: GJoyce

DATA SOURCE:  
NSW DFSI - 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



Table GW1  
Groundwater Analytical Data - BTEXN  
Williamtown Sand Syndicate



Analyte	BTEX												Total Petroleum Hydrocarbons	Total Petroleum Hydrocarbons - Silica Clean up					Total Recoverable Hydrocarbons			Total Recoverable Hydrocarbons - Silica Clean up																	
	LOR				Units				NHMRC ADWG 2018					Sample Name		Sampling Date		C <sub>6</sub> - C <sub>9</sub>		C <sub>10</sub> -C <sub>14</sub> - Silica Cleanup		C <sub>15</sub> -C <sub>28</sub> - Silica Cleanup		C <sub>29</sub> -C <sub>35</sub> Sum - Silica Cleanup		C <sub>6</sub> - C <sub>10</sub>		C <sub>6</sub> - C <sub>10</sub> minus BTEX (F1)		>C <sub>10</sub> -C <sub>16</sub> - Silica Cleanup		F2 - Silica Cleanup		>C <sub>15</sub> -C <sub>24</sub> - Silica Cleanup		>C <sub>24</sub> -C <sub>40</sub> - Silica Cleanup		>C <sub>10</sub> -C <sub>40</sub> - Silica Cleanup	
	Benzene**	Toluene	Ethybenzene	meta- & para-Xylene	ortho-Xylene**	Total Xylenes	Naphthalene **	Sum of BTEX	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							
Baseline Trigger Values (KLF, 2020)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
NHMRG ADWG 2018	1	800	300	-	350	600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
Sample Name	Sampling Date																																						
BH6	27-Feb-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20								
	26-Mar-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20								
BH7	27-Apr-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20								
	16-Jul-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20								
BH8	14-Aug-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20								
	15-Sep-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20								
BH9	16-Nov-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20								
	16-Dec-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20								
BH10	17-Jan-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20								
	16-Jul-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20								

Dry

Table GW1  
Groundwater Analytical Data - BTEXN  
Williamtown Sand Syndicate



### Note

- - Not analysed

< - Less than laboratory limit of reporting

$\mu\text{g/L}$  - Micrograms per litre

BTEXN - Benzene, toluene, ethylbenzene, xylenes, naphthalene  
1. Baseline Water Quality Summary Report, September 2020 (KLE 2020)

## 1- Baseline Water Quality Summary Report

### 2- Remove duplicate value used.

2- Denotes duplicate value used.  
3- Denotes triplcate value used.

3- Denotes triplicate vvalue used.  
\*\* 95% Level of protection is frequently

\*\* 95% Level of protection in freshwater

Table GW2  
Groundwater Analytical Data - Metals  
Williamstown Sand Syndicate



Analyte		Metals															
		Arsenic**	Barium	Beryllium	Boron**	Cadmium**	Chromium** 1	Cobalt	Copper**	Iron	Lead**	Manganese* *	Mercury** <sup>2</sup>	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	
Baseline Trigger Values (KLF 2020) <sup>3</sup>	0.003	0.035	-	-	-	0.004	-	0.013 (0.051 for BH4)	4.1 <sup>4</sup> / 1.0 <sup>5</sup>	-	0.136	-	0.022 (0.037 for BH11)	-	-	0.085	
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																
BH1	21-Feb-19																
	15-Mar-19	< 0.001	0.003	< 0.001	< 0.05	< 0.0001	0.004	< 0.001	< 0.001	13	< 0.001	0.014	< 0.0001	< 0.001	< 0.01	< 0.01	1.27
	23-Apr-19	< 0.001	0.003	< 0.001	< 0.05	< 0.0001	0.004	< 0.001	0.002	10	0.001	0.015	< 0.0001	0.002	< 0.01	< 0.01	0.363
	16-May-19	< 0.001	0.002	< 0.001	< 0.05	< 0.0001	0.003	< 0.001	< 0.001	8.33	< 0.001	0.009	< 0.0001	0.002	< 0.01	< 0.01	0.132
	14-Jun-19	< 0.001	0.001	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.001	6.31	< 0.001	0.009	< 0.0001	< 0.001	< 0.01	< 0.01	0.074
	16-Jul-19	< 0.001	0.002	< 0.001	< 0.05	< 0.0001	0.003	< 0.001	0.002	7.35	< 0.001	0.01	< 0.0001	0.001	< 0.01	< 0.01	0.116
	15-Aug-19	< 0.001	0.002	< 0.001	< 0.05	< 0.0001	0.003	< 0.001	0.002	7.96	< 0.001	0.008	< 0.0001	< 0.001	< 0.01	< 0.01	0.023
	16-Sep-19	< 0.001	0.002	< 0.001	< 0.05	< 0.0001	0.004	< 0.001	0.001	8.84	< 0.001	0.009	< 0.0001	< 0.001	< 0.01	< 0.01	0.034
	15-Oct-19	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	0.003	< 0.001	0.006	4.32	< 0.001	0.007	< 0.0001	< 0.001	< 0.01	< 0.01	0.037
	18-Nov-19	< 0.001	0.001	< 0.001	< 0.05	< 0.0001	0.004	< 0.001	< 0.001	11	< 0.001	0.008	< 0.0001	0.001	< 0.01	< 0.01	0.012
	17-Dec-19	< 0.001	0.002	< 0.001	< 0.05	< 0.0001	0.003	< 0.001	0.001	8.48	< 0.001	0.009	< 0.0001	< 0.001	< 0.01	< 0.01	0.028
	16-Jan-20	< 0.001	0.003	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.002	4.43	< 0.001	0.011	< 0.0001	0.002	< 0.01	< 0.01	0.044
	27-Feb-20	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.022	4.1	< 0.001	0.008	< 0.0001	0.004	< 0.01	< 0.01	0.075
	26-Mar-20	< 0.001	0.006	< 0.001	< 0.05	< 0.0001	0.003	< 0.001	0.021	7.37	< 0.001	0.009	< 0.0001	0.006	< 0.01	< 0.01	0.08
	27-Apr-20	< 0.001	-	-	-	< 0.0001	< 0.001	-	0.002	0.22	< 0.001	0.01	< 0.0001	-	-	-	0.035
	15-May-20	< 0.001	0.006	< 0.001	< 0.05	< 0.0001	0.003	0.002	0.013	8.1	< 0.001	0.012	< 0.0001	0.006	< 0.01	< 0.01	0.065
	19-Jun-20	< 0.001	-	-	-	< 0.0001	0.002	-	0.006	5.74	< 0.001	0.01	< 0.0001	-	-	-	0.06
	16-Jul-20	< 0.001	-	-	-	< 0.0001	0.003	-	0.014	6.22	< 0.001	0.01	< 0.0001	-	-	-	0.08
	14-Aug-20	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.005	4.08	< 0.001	0.01	< 0.0001	< 0.001	< 0.01	< 0.01	0.025
	16-Sep-20	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.005	5.48	< 0.001	0.01	< 0.0001	< 0.001	< 0.01	< 0.01	0.016
	16-Oct-20	< 0.001	0.006	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.001	5.55	< 0.001	0.009	< 0.0001	< 0.001	< 0.01	< 0.01	0.017
	16-Nov-20	< 0.001	0.002	< 0.001	< 0.05	< 0.0001	0.003	< 0.001	0.001	7.05	< 0.001	0.012	< 0.0001	0.006	< 0.01	< 0.01	0.045
	16-Dec-20	< 0.001	0.006	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.008	3.21	< 0.001	0.011	< 0.0001	0.001	< 0.01	< 0.01	0.077
	14-Jan-21	< 0.001	0.002	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.001	5.21	< 0.001	0.013	< 0.0001	< 0.001	< 0.01	< 0.01	0.032
	16-Feb-21	< 0.001	0.003	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.001	3.24	< 0.001	0.015	< 0.0001	< 0.001	< 0.01	< 0.01	0.052
	17-Mar-21	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	< 0.001	4.0	< 0.001	0.027	< 0.0001	< 0.001	< 0.01	< 0.01	0.056
BH2	22-Feb-19	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.002	0.14	< 0.001	0.021	< 0.0001	0.015	< 0.01	< 0.01	0.006
	15-Mar-19	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.003	< 0.05	< 0.001	0.02	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005
	23-Apr-19	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.004	0.19	< 0.001	0.018	< 0.0001	0.001	< 0.01	< 0.01	0.008
	16-May-19	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.001	0.06	< 0.001	0.014	< 0.0001	0.001	< 0.01	< 0.01	< 0.005
	14-Jun-19	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.004	0.08	< 0.001	0.009	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005
	16-Jul-19	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.008	0.05	< 0.001	0.013	< 0.0001	0.001	< 0.01	< 0.01	0.006
	15-Aug-19	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.012	0.08	< 0.001	0.011	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005
	16-Sep-19	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.008	0.26	< 0.001	0.014	< 0.0001	0.001	< 0.01	< 0.01	0.007
	15-Oct-19	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.006	0.46	< 0.001	0.011	< 0.0001	< 0.001	< 0.01	< 0.01	0.007
	18-Nov-19	< 0.001	0.007	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.013	0.08	< 0.001	0.011	< 0.0001	0.007	< 0.01	< 0.01	0.028
	17-Dec-19	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.006	0.1	< 0.001	0.012	< 0.0001	0.001	< 0.01	< 0.01	0.006
	16-Jan-20	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.005	0.73	< 0.001	0.014	< 0.0001	< 0.001	< 0.01	< 0.01	0.01
	27-Feb-20	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.008	0.07	< 0.001	0.012	< 0.0001	0.003	< 0.01	< 0.01	0.021
	26-Mar-20	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.01	0.06	< 0.001	0.012	< 0.0001	0.003	< 0.01	< 0.01	0.034
	27-Apr-20	< 0.001	-	-	-	< 0.0001	< 0.001	-	0.011	< 0.05	0.001	0.015	< 0.0001	-	-	-	0.024
	15-May-20	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.012	< 0.05	< 0.001	0.014	< 0.0001	0.003	< 0.01	< 0.01	0.031
	19-Jun-20	< 0.001	-	-	-	< 0.0001	< 0.001	-	0.024	0.08	< 0.001	0.014	< 0.0001	-	-	-	0.043
	16-Jul-20	< 0.001	-	-	-	< 0.0001	< 0.001	-	0.029	< 0.5	< 0.001	0.012	< 0.0001	-	-	-	0.033
	14-Aug-20	< 0.001	0.008	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.062	0.22	< 0.001	0.015	< 0.0001	< 0.001	< 0.01	< 0.01	0.006
	16-Sep-20	< 0.001	0.012	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.026	0.07	< 0.001	0.016	< 0.0001	< 0.001	< 0.01	< 0.01	0.006
	16-Oct-20	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.013	< 0.05	< 0.001	0.015	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005
	16-Nov-20	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.02	0.36	< 0.001	0.015	< 0.0001	< 0.001	< 0.01	< 0.01	0.018</

Table GW2  
Groundwater Analytical Data - Metals  
Williamstown Sand Syndicate



Analyte		Metals															
		Arsenic**	Barium	Beryllium	Boron**	Cadmium**	Chromium** 1	Cobalt	Copper**	Iron	Lead**	Manganese* *	Mercury** <sup>2</sup>	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
Baseline Trigger Values (KLF 2020) <sup>3</sup>		0.003	0.035	-	-	-	0.004	-	0.013 (0.051 for BH4)	4.1 <sup>4</sup> / 1.0 <sup>5</sup>	-	0.136	-	0.022 (0.037 for BH11)	-	-	0.085
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																
BH4	23-Apr-19	< 0.001	0.013	< 0.001	0.05	< 0.0001	< 0.001	< 0.001	0.002	0.99	< 0.001	0.045	< 0.0001	0.007	< 0.01	< 0.01	0.008
	16-May-19	< 0.001	0.013	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	< 0.001	0.27	< 0.001	0.022	< 0.0001	0.022	< 0.01	< 0.01	0.011
	14-Jun-19	< 0.001	0.012	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.038	< 0.05	< 0.001	0.014	< 0.0001	< 0.001	< 0.01	< 0.01	0.005
	16-Jul-19	< 0.001	0.013	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.046	< 0.05	< 0.001	0.019	< 0.0001	< 0.001	< 0.01	< 0.01	0.007
	15-Aug-19	< 0.001	0.013	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.026	< 0.05	< 0.001	0.018	< 0.0001	0.001	< 0.01	< 0.01	0.007
	16-Sep-19	< 0.001	0.012	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.051	0.19	< 0.001	0.026	< 0.0001	0.002	< 0.01	< 0.01	0.005
	15-Oct-19	< 0.001	0.01	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.011	0.31	< 0.001	0.136	< 0.0001	0.002	< 0.01	< 0.01	0.014
	18-Nov-19	< 0.001	0.011	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.005	< 0.05	< 0.001	0.013	< 0.0001	0.001	< 0.01	< 0.01	< 0.005
	17-Dec-19	< 0.001	0.012	< 0.001	0.06	< 0.0001	0.001	< 0.001	0.008	< 0.05	< 0.001	0.014	< 0.0001	< 0.001	< 0.01	< 0.01	0.005
	16-Jan-20	< 0.001	0.014	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.006	< 0.05	< 0.001	0.014	< 0.0001	< 0.001	< 0.01	< 0.01	0.009
	27-Feb-20	< 0.001	0.009	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	0.006	0.09	< 0.001	0.013	< 0.0001	0.001	< 0.01	< 0.01	0.009
	26-Mar-20	< 0.001	0.01	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.002	0.2	< 0.001	0.014	< 0.0001	0.002	< 0.01	< 0.01	0.024
	27-Apr-20	< 0.001	-	-	-	< 0.0001	< 0.001	-	0.006	0.22	< 0.001	0.028	< 0.0001	-	-	-	0.018
	15-May-20	< 0.001	0.012	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.052	0.13	< 0.001	0.019	< 0.0001	0.004	< 0.01	< 0.01	0.037
	19-Jun-20	< 0.001	-	-	-	< 0.0001	< 0.001	-	0.079	0.14	< 0.001	0.016	< 0.001	-	-	-	0.033
	16-Jul-20	< 0.001	-	-	-	< 0.0001	< 0.001	-	0.069	0.06	< 0.001	0.01	< 0.001	-	-	-	< 0.005
	14-Aug-20	< 0.001	0.008	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.083	0.09	< 0.001	0.011	< 0.0001	< 0.001	< 0.01	< 0.01	0.012
	16-Sep-20	< 0.001	0.013	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.078	0.06	< 0.001	0.012	< 0.0001	< 0.001	< 0.01	< 0.01	0.006
	16-Oct-20	< 0.001	0.01	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.003	0.25	< 0.001	0.021	< 0.0001	0.001	< 0.01	< 0.01	0.018
	16-Nov-20	< 0.001	0.008	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.005	0.18	< 0.001	0.008	< 0.0001	0.001	< 0.01	< 0.01	0.005
	16-Dec-20	< 0.001	0.011	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.002	0.46	< 0.001	0.027	< 0.0001	0.003	< 0.01	< 0.01	< 0.005
	14-Jan-21	< 0.001	0.01	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.012	0.27	< 0.001	0.012	< 0.0001	0.002	< 0.01	< 0.01	0.006
	16-Feb-21	< 0.001	0.02	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.002	0.94	< 0.001	0.023	< 0.0001	0.003	< 0.01	< 0.01	0.008
	17-Mar-21	< 0.001	0.027	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.006	1.39	< 0.001	0.029	< 0.0001	0.002	< 0.01	< 0.01	0.019
BH5	22-Feb-19	< 0.001	0.01	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	< 0.001	1.4	< 0.001	0.005	< 0.0001	0.003	< 0.01	< 0.01	0.008
	14-Aug-20	< 0.001	0.015	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.006	0.33	< 0.001	0.003	< 0.0001	0.002	< 0.01	< 0.01	0.01
	22-Feb-19	< 0.001	0.03	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.002	1.03	< 0.001	0.014	< 0.0001	0.001	< 0.01	< 0.01	0.019
	14-Mar-19	< 0.001	0.027	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.001	1.9	< 0.001	0.01	< 0.0001	< 0.001	< 0.01	< 0.01	0.012
	23-Apr-19	< 0.001	0.03	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.001	0.96	< 0.001	0.01	< 0.0001	< 0.001	< 0.01	< 0.01	0.022
	16-May-19	< 0.001	0.029	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.001	2.57	< 0.001	0.009	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005
	14-Jun-19	< 0.001	0.027	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.001	2.86	< 0.001	0.008	< 0.0001	< 0.001	< 0.01	< 0.01	0.008
	16-Jul-19	< 0.001	0.026	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.002	2.41	< 0.001	0.008	< 0.0001	< 0.001	< 0.01	< 0.01	0.005
	15-Aug-19	< 0.001	0.026	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.001	2.19	< 0.001	0.008	< 0.0001	< 0.001	< 0.01	< 0.01	0.007
	16-Sep-19	< 0.001	0.034	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.008	2.08	< 0.001	0.012	< 0.0001	0.007	< 0.01	< 0.01	0.035
	15-Oct-19	< 0.001	0.026	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.001	1.95	< 0.001	0.009	< 0.0001	< 0.001	< 0.01	< 0.01	0.006
	18-Nov-19	< 0.001	0.03	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.001	1.58	< 0.001	0.009	< 0.0001	0.008	< 0.01	< 0.01	0.073
	17-Dec-19	< 0.001	0.026	< 0.001	0.05	< 0.0001	0.001	< 0.001	0.003	1.78	< 0.001	0.007	< 0.0001	0.001	< 0.01	< 0.01	0.006
	16-Jan-20	< 0.001	0.032	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.001	2.15	< 0.001	0.01	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005
	27-Feb-20	< 0.001	0.03	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.001	1.69	< 0.001	0.01	< 0.0001	0.004	< 0.01	< 0.01	0.019
	26-Mar-20	< 0.001	0.028	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.001	1.51	< 0.001	0.01	< 0.0001	< 0.001	< 0.01	< 0.01	0.03
	27-Apr-20	< 0.001	-	-	-	< 0.0001	< 0.001	-	0.002	1.14	< 0.001	0.014	< 0.0001	-	-	-	0.041
	15-May-20	< 0.001	0.045	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.001	1.89	< 0.001	0.01	< 0.0001	< 0.001	< 0.01	< 0.01	0.007
	19-Jun-20	< 0.001	-	-	-	< 0.0001	< 0.001	-	0.007	2.49	< 0.001	0.018	< 0.0001	-	-	-	0.053
	16-Jul-20	< 0.001	-	-	-	< 0.0001	< 0.001	-	0.002	1.98	< 0.001	0.016	< 0.0001	-	-	-	0.036
	14-Aug-20	< 0.001	0.05	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.001	2	< 0.001	0.014	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005
	16-Sep-20	< 0.001	0.047	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.002	1.78	< 0.001	0.01	< 0.0001	< 0.001	< 0.01	< 0.01	0.006
	16-Oct-20	< 0.001	0.04	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.001	1.84	< 0.001	0.011	< 0.0001	< 0.001	< 0.01</		

Table GW2  
Groundwater Analytical Data - Metals  
Williamstown Sand Syndicate



Analyte		Metals															
		Arsenic**	Barium	Beryllium	Boron**	Cadmium**	Chromium** 1	Cobalt	Copper**	Iron	Lead**	Manganese* *	Mercury** <sup>2</sup>	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
Baseline Trigger Values (KLF 2020) <sup>3</sup>		0.003	0.035	-	-	-	0.004	-	0.013 (0.051 for BH4)	4.1 <sup>4</sup> / 1.0 <sup>5</sup>	-	0.136	-	0.022 (0.037 for BH11)	-	-	0.085
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																
BH7	22-Feb-19	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	0.002	0.003	< 0.001	1.8	< 0.001	0.026	< 0.0001	0.004	< 0.01	< 0.01	0.019
	14-Mar-19	< 0.001	0.01	< 0.001	< 0.05	< 0.0001	0.001	0.003	< 0.001	1.8	< 0.001	0.02	< 0.0001	0.004	< 0.01	< 0.01	0.009
	23-Apr-19	< 0.001	0.012	< 0.001	< 0.05	< 0.0001	0.002	0.003	< 0.001	2.0	< 0.001	0.026	< 0.0001	0.004	< 0.01	< 0.01	0.01
	16-May-19	< 0.001	0.008	< 0.001	< 0.05	< 0.0001	0.002	0.003	< 0.001	2.32	< 0.001	0.035	< 0.0001	0.005	< 0.01	< 0.01	0.013
	14-Jun-19	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	0.002	0.002	< 0.001	2.06	< 0.001	0.03	< 0.0001	0.004	< 0.01	< 0.01	0.006
	16-Jul-19	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	0.002	0.002	< 0.001	1.66	< 0.001	0.025	< 0.0001	0.003	< 0.01	< 0.01	< 0.005
	15-Aug-19	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	0.002	0.002	< 0.001	1.54	< 0.001	0.023	< 0.0001	0.003	< 0.01	< 0.01	< 0.005
	16-Sep-19	< 0.001	0.016	< 0.001	0.06	< 0.0001	0.002	0.002	0.007	1.42	0.001	0.024	< 0.0001	0.02	< 0.01	< 0.01	0.085
	15-Oct-19	< 0.001	0.009	< 0.001	< 0.05	< 0.0001	0.002	0.002	0.003	1.32	< 0.001	0.018	< 0.0001	0.003	< 0.01	< 0.01	0.011
	18-Nov-19	< 0.001	0.016	< 0.001	< 0.05	< 0.0001	0.002	0.002	< 0.001	1.1	< 0.001	0.015	< 0.0001	0.013	< 0.01	< 0.01	0.053
	17-Dec-19	< 0.001	0.009	< 0.001	0.06	< 0.0001	0.002	0.001	< 0.001	0.98	< 0.001	0.011	< 0.0001	0.003	< 0.01	< 0.01	0.007
	16-Jan-20	< 0.001	0.01	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	< 0.001	0.93	< 0.001	0.006	< 0.0001	0.003	< 0.01	< 0.01	0.007
	27-Feb-20	< 0.001	0.01	< 0.001	< 0.05	< 0.0001	0.003	< 0.001	< 0.001	1.18	< 0.001	0.008	< 0.0001	0.004	< 0.01	< 0.01	0.027
	26-Mar-20	< 0.001	0.01	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	< 0.001	0.9	< 0.001	0.009	< 0.0001	0.005	< 0.01	< 0.01	0.084
	27-Apr-20	< 0.001	-	-	-	< 0.0001	0.003	-	0.012	0.92	< 0.001	0.011	< 0.0001	-	-	-	0.033
	15-May-20	< 0.001	0.01	< 0.001	< 0.05	< 0.0001	0.003	0.002	0.005	1.26	< 0.001	0.016	< 0.0001	0.007	< 0.01	< 0.01	0.045
	19-Jun-20	< 0.001	-	-	-	< 0.0001	0.003	-	0.002	1.36	< 0.001	0.019	< 0.0001	-	-	-	0.043
	16-Jul-20	< 0.001	-	-	-	< 0.0001	0.003	-	0.004	1.14	< 0.001	0.02	< 0.0001	-	-	-	0.041
	14-Aug-20	< 0.001	0.013	< 0.001	< 0.05	< 0.0001	0.002	0.002	< 0.001	1.5	< 0.001	0.024	< 0.0001	0.002	< 0.01	< 0.01	< 0.005
	16-Sep-20	< 0.001	0.013	< 0.001	< 0.05	< 0.0001	0.002	0.002	< 0.001	1.67	< 0.001	0.021	< 0.0001	0.003	< 0.01	< 0.01	0.006
	16-Oct-20	< 0.001	0.009	< 0.001	< 0.05	< 0.0001	0.002	0.002	< 0.001	1.49	< 0.001	0.015	< 0.0001	0.003	< 0.01	< 0.01	0.015
	16-Nov-20	< 0.001	0.006	< 0.001	< 0.05	< 0.0001	0.002	0.003	< 0.001	1.72	< 0.001	0.023	< 0.0001	0.003	< 0.01	< 0.01	0.006
	16-Dec-20	< 0.001	0.003	< 0.001	< 0.05	< 0.0001	0.002	0.002	< 0.001	1.79	< 0.001	0.024	< 0.0001	0.003	< 0.01	< 0.01	< 0.005
	14-Jan-21	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	0.002	0.002	0.004	1.65	< 0.001	0.025	< 0.0001	0.004	< 0.01	< 0.01	0.017
	16-Feb-21	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	0.002	0.002	0.002	1.74	< 0.001	0.025	< 0.0001	0.004	< 0.01	< 0.01	0.013
	17-Mar-21	< 0.001	0.009	< 0.001	< 0.05	< 0.0001	0.002	0.003	< 0.001	2.28	< 0.001	0.028	< 0.0001	0.005	< 0.01	< 0.01	< 0.005
BH8	21-Feb-19	0.001 *	0.011	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	< 0.001	4.1	< 0.001	0.012	< 0.0001	0.002	< 0.01	< 0.01	0.006
	14-Mar-19	< 0.001	0.006	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	< 0.001	3.25	< 0.001	0.008	< 0.0001	0.002	< 0.01	< 0.01	< 0.005
	23-Apr-19	0.001	0.008	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	< 0.001	3.2	< 0.001	0.009	< 0.0001	0.002	< 0.01	< 0.01	0.008
	16-May-19	0.003	0.01	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	< 0.001	3.0	< 0.001	0.01	< 0.0001	0.003	< 0.01	< 0.01	< 0.005
	14-Jun-19	< 0.001	0.01	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	< 0.001	2.5	< 0.001	0.005	< 0.0001	0.002	< 0.01	< 0.01	0.006
	16-Jul-19	0.001	0.012	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	< 0.001	2.6	< 0.001	0.004	< 0.0001	0.002	< 0.01	< 0.01	< 0.005
	15-Aug-19	0.001	0.008	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	< 0.001	1.72	< 0.001	0.004	< 0.0001	0.001	< 0.01	< 0.01	< 0.005
	16-Sep-19	0.001	0.01	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	< 0.001	2.06	< 0.001	0.005	< 0.0001	0.002	< 0.01	< 0.01	< 0.005
	15-Oct-19	< 0.001	0.007	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	0.002	2.08	< 0.001	0.009	< 0.0001	0.002	< 0.01	< 0.01	0.011
	18-Nov-19	< 0.001	0.012	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.002	2.49	< 0.001	0.01	< 0.0001	0.013	< 0.01	< 0.01	0.053
	17-Dec-19	< 0.001	0.007	< 0.001	0.05	< 0.0001	0.002	< 0.001	0.003	3.02	< 0.001	0.011	< 0.0001	0.002	< 0.01	< 0.01	0.007
	16-Jan-20	< 0.001	0.007	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	< 0.001	2.94	< 0.001	0.011	< 0.0001	0.002	< 0.01	< 0.01	0.011
	27-Feb-20	< 0.001	0.007	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	< 0.001	2.56	< 0.001	0.01	< 0.0001	0.005	< 0.01	< 0.01	0.032
	26-Mar-20	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	< 0.001	3.17	< 0.001	0.012	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005
	27-Apr-20	< 0.001	-	-	-	< 0.0001	0.002	-	0.002	3.32	< 0.001	0.016	< 0.0001	-	-	-	0.046
	15-May-20	0.001	0.009	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	0.001	3.49	< 0.001	0.015	< 0.0001	0.006	< 0.01	< 0.01	0.04
	19-Jun-20	0.001	-	-	-	0.0002	0.001	-	0.012	3.3	< 0.001	0.031	< 0.0001	-	-	-	0.057
	16-Jul-20	< 0.001	-	-	-	< 0.0001	0.001	-	0.002	2.87	< 0.001	0.006	< 0.0001	-	-	-	< 0.005
	14-Aug-20	< 0.001	0.02	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	< 0.001	3.14	< 0.001	0.008	< 0.0001	0.002	< 0.01	< 0.01	0.007
	16-Sep-20	< 0.001	0.014	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	0.035	3.35	0.001	0.009	< 0.0001	0.009	< 0.01	< 0.01	0.039
	16-Oct-20	0.001	0.009	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	< 0.001	3.03	< 0.001	0.007	< 0.0001	0.002	< 0.01	< 0.01	0.012
	16-Nov-20	< 0.001	0.013	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.001	3.48	< 0.001	0.008	< 0.0001</				

Table GW2  
Groundwater Analytical Data - Metals  
Williamstown Sand Syndicate



Analyte		Metals															
		Arsenic**	Barium	Beryllium	Boron**	Cadmium**	Chromium** 1	Cobalt	Copper**	Iron	Lead**	Manganese* *	Mercury** <sup>2</sup>	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	0.001	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
Baseline Trigger Values (KLF 2020) <sup>3</sup>		0.003	0.035	-	-	-	0.004	-	0.013 (0.051 for BH4)	4.1 <sup>4</sup> / 1.0 <sup>5</sup>	-	0.136	-	0.022 (0.037 for BH11)	-	-	0.085
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																
BH9A	16-Sep-20	< 0.001	<b>0.028</b>	< 0.001	< 0.05	< 0.0001	< 0.001	<b>0.002</b>	<b>0.004</b>	<b>0.14</b>	< 0.001	<b>0.076</b>	< 0.0001	<b>0.002</b>	< 0.01	< 0.01	<b>0.02</b>
	16-Oct-20	< 0.001	<b>0.001</b>	< 0.001	< 0.05	< 0.0001	< 0.001	<b>0.001</b>	<b>0.001</b>	<b>0.06</b>	< 0.001	<b>0.042</b>	< 0.0001	<b>0.003</b>	< 0.01	< 0.01	<b>0.016</b>
	16-Nov-20	< 0.001	<b>0.001</b>	< 0.001	< 0.05	< 0.0001	< 0.001	<b>0.001</b>	<b>0.001</b>	<b>0.11</b>	< 0.001	<b>0.03</b>	< 0.0001	<b>0.002</b>	< 0.01	< 0.01	<b>0.011</b>
	16-Dec-20	< 0.001	<b>0.001</b>	< 0.001	< 0.05	< 0.0001	< 0.001	<b>0.001</b>	<b>0.01</b>	<b>0.31</b>	< 0.001	<b>0.024</b>	< 0.0001	<b>0.002</b>	< 0.01	< 0.01	<b>0.006</b>
	14-Jan-21	< 0.001	<b>0.002</b>	< 0.001	< 0.05	< 0.0001	<b>0.001</b>	< 0.001	<b>0.017</b>	<b>0.14</b>	< 0.001	<b>0.025</b>	< 0.0001	<b>0.004</b>	< 0.01	< 0.01	<b>0.011</b>
	16-Feb-21	< 0.001	<b>0.001</b>	< 0.001	< 0.05	< 0.0001	< 0.001	<b>0.001</b>	< 0.001	<b>0.35</b>	< 0.001	<b>0.024</b>	< 0.0001	<b>0.003</b>	< 0.01	< 0.01	<b>0.006</b>
	17-Mar-21	< 0.001	<b>0.006</b>	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	< 0.001	<b>0.27</b>	< 0.001	<b>0.024</b>	< 0.0001	<b>0.002</b>	< 0.01	< 0.01	<b>0.01</b>
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																
	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																
BH11	21-Feb-19	< 0.001	<b>0.008</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	<b>0.001</b>	< 0.001	<b>0.26</b>	< 0.001	<b>0.003</b>	< 0.0001	<b>0.005</b>	< 0.01	< 0.01	<b>0.031</b>
	15-Mar-19	< 0.001	<b>0.005</b>	< 0.001	< 0.05	< 0.0001	<b>0.001</b>	< 0.001	< 0.001	<b>1.49</b>	< 0.001	<b>0.007</b>	< 0.0001	<b>0.037</b>	< 0.01	< 0.01	<b>0.016</b>
	23-Apr-19	< 0.001	<b>0.006</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	< 0.001	<b>0.98</b>	< 0.001	<b>0.007</b>	< 0.0001	<b>0.07</b>	< 0.01	< 0.01	<b>0.04</b>
	16-May-19	< 0.001	<b>0.005</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	< 0.001	<b>0.97</b>	< 0.001	<b>0.006</b>	< 0.0001	<b>0.004</b>	< 0.01	< 0.01	<b>0.024</b>
	14-Jun-19	< 0.001	<b>0.004</b>	< 0.001	< 0.05	< 0.0001	<b>0.001</b>	< 0.001	< 0.001	<b>0.98</b>	< 0.001	<b>0.005</b>	< 0.0001	<b>0.001</b>	< 0.01	< 0.01	<b>0.005</b>
	16-Jul-19	< 0.001	<b>0.01</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	< 0.001	<b>0.47</b>	< 0.001	<b>0.003</b>	< 0.0001	<b>0.004</b>	< 0.01	< 0.01	<b>0.007</b>
	15-Aug-19	< 0.001	<b>0.004</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	<b>0.001</b>	<b>0.87</b>	< 0.001	<b>0.007</b>	< 0.0001	<b>0.001</b>	< 0.01	< 0.01	<b>0.005</b>
	16-Sep-19	< 0.001	<b>0.005</b>	< 0.001	< 0.05	< 0.0001	<b>0.001</b>	< 0.001	< 0.001	<b>0.79</b>	< 0.001	<b>0.008</b>	< 0.0001	<b>0.002</b>	< 0.01	< 0.01	<b>0.012</b>
	15-Oct-19	< 0.001	<b>0.004</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	<b>0.004</b>	<b>0.74</b>	< 0.001	<b>0.006</b>	< 0.0001	<b>0.003</b>	< 0.01	< 0.01	<b>0.016</b>
	18-Nov-19	< 0.001	<b>0.004</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	< 0.001	<b>0.95</b>	< 0.001	<b>0.008</b>	< 0.0001	<b>0.002</b>	< 0.01	< 0.01	< 0.005
	17-Dec-19	< 0.001	<b>0.004</b>	< 0.001	<b>0.06</b>	< 0.0001	<b>0.002</b>	< 0.001	<b>0.002</b>	<b>1</b>	< 0.001	<b>0.008</b>	< 0.0001	<b>0.001</b>	< 0.01	< 0.01	<b>0.006</b>
	16-Jan-20	< 0.001	<b>0.005</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	<b>0.001</b>	<b>1.08</b>	< 0.001	<b>0.007</b>	< 0.0001	<b>0.003</b>	< 0.01	< 0.01	<b>0.005</b>
	27-Feb-20	< 0.001	<b>0.004</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	< 0.001	<b>0.6</b>	< 0.001	<b>0.003</b>	< 0.0001	<b>0.002</b>	< 0.01	< 0.01	<b>0.027</b>
	26-Mar-20	< 0.001	<b>0.007</b>	< 0.001	< 0.05	< 0.0001	<b>0.001</b>	< 0.001	< 0.001	<b>0.36</b>	< 0.001	<b>0.004</b>	< 0.0001	<b>0.006</b>	< 0.01	< 0.01	<b>0.038</b>
	27-Apr-20	< 0.001	-	-	-	< 0.0001	< 0.001	-	<b>0.002</b>	<b>0.22</b>	< 0.001	<b>0.005</b>	< 0.0001	-	-	-	<b>0.035</b>
	15-May-20	< 0.001	<b>0.008</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	<b>0.009</b>	<b>0.78</b>	< 0.001	<b>0.01</b>	< 0.0001	<b>0.007</b>	< 0.01	< 0.01	<b>0.025</b>
	19-Jun-20	< 0.001	-	-	-	< 0.0001	<b>0.001</b>	-	<b>0.003</b>	<b>0.72</b>	< 0.001	<b>0.007</b>	< 0.0001	-	-	-	<b>0.051</b>
	16-Jul-20	< 0.001	-	-	-	< 0.0001	<b>0.001</b>	-	<b>0.001</b>	<b>1</b>	< 0.001	<b>0.007</b>	< 0.0001	-	-	-	<b>0.005</b>
	14-Aug-20	< 0.001	<b>0.012</b>	< 0.001	< 0.05	< 0.0001	<b>0.001</b>	< 0.001	<b>0.004</b>	<b>0.75</b>	< 0.001	<b>0.004</b>	< 0.0001	< 0.001	< 0.01	< 0.01	<b>0.017</b>
	16-Sep-20	< 0.001	<b>0.014</b>	< 0.001	< 0.05	< 0.0001	<b>0.001</b>	< 0.001	<b>0.005</b>	<b>0.9</b>	< 0.001	<b>0.008</b>	< 0.0001	< 0.001	< 0.01	< 0.01	<b>0.009</b>
	16-Oct-20	< 0.001	<b>0.007</b>	< 0.001	< 0.05	< 0.0001	<b>0.001</b>	< 0.001	< 0.001	<b>1.06</b>	< 0.001	<b>0.009</b>	< 0.0001	<b>0.002</b>	< 0.01	< 0.01	<b>0.01</b>

Table GW2  
Groundwater Analytical Data - Metals  
Williamtown Sand Syndicate



Analyte		Metals															
		Arsenic**	Barium	Beryllium	Boron**	Cadmium**	Chromium** <sup>1</sup>	Cobalt	Copper**	Iron	Lead**	Manganese* <sup>*</sup>	Mercury** <sup>2</sup>	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	
Baseline Trigger Values (KLF 2020) <sup>3</sup>	0.003	0.035	-	-	-	0.004	-	0.013 (0.051 for BH4)	4.1 <sup>4</sup> / 1.0 <sup>5</sup>	-	0.136	-	0.022 (0.037 for BH11)	-	-	0.085	
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																
BH12	16-Nov-20	< 0.001	<b>0.007</b>	< 0.001	< 0.05	< 0.0001	<b>0.001</b>	< 0.001	< 0.001	<b>0.84</b>	< 0.001	<b>0.011</b>	< 0.0001	<b>0.002</b>	< 0.01	< 0.01	<b>0.016</b>
	16-Dec-20	< 0.001	<b>0.008</b>	< 0.001	< 0.05	< 0.0001	<b>0.001</b>	< 0.001	< 0.001	<b>1.0</b>	< 0.001	<b>0.009</b>	< 0.0001	<b>0.002</b>	< 0.01	< 0.01	<b>0.008</b>
	14-Jan-21	< 0.001	<b>0.008</b>	< 0.001	< 0.05	< 0.0001	<b>0.001</b>	< 0.001	<b>0.025</b>	<b>0.56</b>	< 0.001	<b>0.006</b>	< 0.0001	<b>0.004</b>	< 0.01	< 0.01	<b>0.018</b>
	16-Feb-21	< 0.001	<b>0.008</b>	< 0.001	< 0.05	< 0.0001	<b>0.001</b>	< 0.001	<b>0.018</b>	<b>0.59</b>	< 0.001	<b>0.008</b>	< 0.0001	<b>0.007</b>	< 0.01	< 0.01	<b>0.03</b>
	17-Mar-21	< 0.001	<b>0.01</b>	< 0.001	< 0.05	< 0.0001	<b>0.001</b>	< 0.001	< 0.001	<b>0.2</b>	< 0.001	<b>0.002</b>	< 0.0001	<b>0.003</b>	< 0.01	< 0.01	<b>0.014</b>
	14-Aug-20	< 0.001	<b>0.012</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	<b>0.001</b>	<b>0.08</b>	< 0.001	<b>0.008</b>	< 0.0001	< 0.001	< 0.01	< 0.01	<b>0.022</b>
	16-Sep-20	Hydrasleeves too large for 40mm diameter well casing- no samples taken															
MW239S	16-Oct-20	Hydrasleeves too large for 40mm diameter well casing- no samples taken															
	16-Nov-20	< 0.001	-	-	-	< 0.0001	<b>0.002</b>	-	<b>0.002</b>	-	< 0.001	-	< 0.0001	<b>0.002</b>	-	-	<b>0.017</b>
	22-Feb-19	< 0.001	<b>0.007</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	< 0.001	<b>1.11</b>	< 0.001	<b>0.003</b>	< 0.0001	<b>0.001</b>	< 0.01	< 0.01	<b>0.006</b>
	14-Mar-19	< 0.001	<b>0.008</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	< 0.001	<b>1.25</b>	< 0.001	<b>0.005</b>	< 0.0001	<b>0.005</b>	< 0.01	< 0.01	<b>0.008</b>
	23-Apr-19	< 0.001	<b>0.008</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	< 0.001	<b>1.01</b>	< 0.001	<b>0.004</b>	< 0.0001	<b>0.004</b>	< 0.01	< 0.01	<b>0.007</b>
	16-May-19	< 0.001	<b>0.005</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	< 0.001	<b>0.87</b>	< 0.001	<b>0.003</b>	< 0.0001	<b>0.002</b>	< 0.01	< 0.01	< 0.005
	14-Jun-19	< 0.001	<b>0.005</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	<b>0.002</b>	<b>0.8</b>	< 0.001	<b>0.003</b>	< 0.0001	<b>0.001</b>	< 0.01	< 0.01	< 0.005
	16-Jul-19	< 0.001	<b>0.006</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	< 0.001	<b>0.87</b>	< 0.001	<b>0.003</b>	< 0.0001	<b>0.002</b>	< 0.01	< 0.01	< 0.005
MW239S	15-Aug-19	< 0.001	<b>0.006</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	< 0.001	<b>1.0</b>	< 0.001	<b>0.004</b>	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005
	16-Sep-19	< 0.001	<b>0.01</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	<b>0.002</b>	<b>0.94</b>	< 0.001	<b>0.006</b>	< 0.0001	<b>0.006</b>	< 0.01	< 0.01	<b>0.032</b>
	15-Oct-19	< 0.001	<b>0.005</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	<b>0.003</b>	<b>0.68</b>	< 0.001	<b>0.004</b>	< 0.0001	<b>0.002</b>	< 0.01	< 0.01	<b>0.011</b>
	18-Nov-19	< 0.001	<b>0.01</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	< 0.001	<b>1.1</b>	< 0.001	<b>0.004</b>	< 0.0001	<b>0.008</b>	< 0.01	< 0.01	<b>0.03</b>
	17-Dec-19	< 0.001	<b>0.008</b>	< 0.001	< 0.05	< 0.0001	<b>0.003</b>	< 0.001	<b>0.001</b>	<b>1.33</b>	< 0.001	<b>0.003</b>	< 0.0001	<b>0.002</b>	< 0.01	< 0.01	< 0.005
	16-Jan-20	< 0.001	<b>0.008</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	< 0.001	<b>1.31</b>	< 0.001	<b>0.004</b>	< 0.0001	<b>0.002</b>	< 0.01	< 0.01	<b>0.007</b>
	27-Feb-20	< 0.001	<b>0.008</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	< 0.001	<b>1.03</b>	< 0.001	<b>0.002</b>	< 0.0001	<b>0.002</b>	< 0.01	< 0.01	<b>0.019</b>
	26-Mar-20	< 0.001	<b>0.008</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	<b>0.001</b>	<b>0.97</b>	< 0.001	<b>0.004</b>	< 0.0001	<b>0.003</b>	< 0.01	< 0.01	<b>0.032</b>
	27-Apr-20	< 0.001	-	-	-	< 0.0001	<b>0.002</b>	-	<b>0.002</b>	<b>1.14</b>	< 0.001	<b>0.005</b>	< 0.0001	-	-	-	<b>0.041</b>
	15-May-20	< 0.001	<b>0.011</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	<b>0.006</b>	<b>1.17</b>	< 0.001	<b>0.004</b>	< 0.0001	<b>0.006</b>	< 0.01	< 0.01	<b>0.028</b>
	19-Jun-20	< 0.001	-	-	-	< 0.0001	<b>0.002</b>	-	<b>0.002</b>	<b>0.9</b>	< 0.001	<b>0.004</b>	< 0.0001	-	-	-	<b>0.057</b>
	16-Jul-20	< 0.001	-	-	-	< 0.0001	<b>0.002</b>	-	<b>0.01</b>	<b>0.55</b>	<b>0.001</b>	<b>0.006</b>	< 0.0001	-	-	-	<b>0.053</b>
	14-Aug-20	< 0.001	<b>0.017</b>	< 0.001	< 0.05	< 0.0001	<b>0.001</b>	< 0.001	<b>0.002</b>	<b>0.38</b>	< 0.001	<b>0.006</b>	< 0.0001	<b>0.001</b>	< 0.01	< 0.01	<b>0.006</b>
	16-Sep-20	< 0.001	<b>0.016</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	<b>0.002</b>	<b>0.51</b>	< 0.001	<b>0.008</b>	< 0.0001	<b>0.002</b>	< 0.01	< 0.01	<b>0.006</b>
	16-Oct-20	< 0.001	<b>0.009</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	< 0.001	<b>1.17</b>	< 0.001	<b>0.009</b>	< 0.0001	<b>0.002</b>	< 0.01	< 0.01	<b>0.005</b>
	16-Nov-20	< 0.001	<b>0.01</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	<b>0.001</b>	<b>0.3</b>	< 0.001	<b>0.011</b>	< 0.0001	<b>0.003</b>	< 0.01	< 0.01	<b>0.021</b>
	16-Dec-20	< 0.001	<b>0.01</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	< 0.001	<b>1.06</b>	< 0.001	<b>0.011</b>	< 0.0001	<b>0.002</b>	< 0.01	< 0.01	< 0.005
	14-Jan-21	< 0.001	<b>0.011</b>	< 0.001	< 0.05	< 0.0001	<b>0.001</b>	< 0.001	<b>0.005</b>	<b>0.77</b>	< 0.001	<b>0.012</b>	< 0.0001	<b>0.004</b>	< 0.01	< 0.01	<b>0.011</b>
	16-Feb-21	< 0.001	<b>0.011</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	<b>0.001</b>	<b>0.01</b>	<b>0.92</b>	< 0.001	<b>0.012</b>	< 0.0001	<b>0.009</b>	< 0.01	< 0.01	<b>0.014</b>
	17-Mar-21	< 0.001	<b>0.011</b>	< 0.001	< 0.05	< 0.0001	<b>0.002</b>	< 0.001	< 0.001	<b>0.95</b>	< 0.001	<b>0.01</b>	< 0.0001	<b>0.004</b>	< 0.01	< 0.01	<b>0.009</b>

**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

<sup>1</sup> value for CR VI

<sup>2</sup> as inorganic

<sup>3</sup> Baseline Water Quality Summary Report, September 2020 (KLF 2020)

<sup>4</sup> Northern half of site - BH6, BH7, BH8, BH11 & MW239S

<sup>5</sup> Southern half of site - BH2, BH4 & BH9



Table GW3  
Groundwater Analytical Data - PFAS  
McKinney Sand Contaminant



**Notes:**

- Not analysed
- < - Less than laboratory limit of report
- ul - Micrograms per litre
- \*\*\* 99% Level of protection in freshwater
- 1 Baseline Summary Report Criteria (K)
- 2 Denotes duplicate value used.
- 3 Denotes triplicate value used.
- 4 Recreation water
- 5 RHD 15/00/2010 Sample received

\* BH9A 16/09/2020 Sample required

20193820.001A

Analyte	Anions and Cations												Alkalinity																	
	Sodium	Calcium	Magnesium	Potassium	Sulphate	Chloride	Fluoride	Total Phosphorus	Nitrite as N	Nitrate as N	Nitrile + Nitrate as N	Ammonia as N	Total Nitrogen as N	Total Kjeldahl Nitrogen as N	Total Cations	Total Anions	Tonic 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	Inorganics	Total Dissolved Solids	Total Dissolved Solids	pH		
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	meq/L	meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm	mg/L
Baseline, Tapwater (400000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
NaOH, 20%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Sample Name	Sample Date												Block																	
15-Mar-19	11	2.0	1.0	< 1.0	< 1.0	25	< 0.1	-	-	-	-	-	-	-	0.66	0.88	-	-	9.0	< 1.0	9.0	9.0	104	68	129	5.67				
7-Mar-19	14	1.0	2.0	< 1.0	4.0	25	< 0.1	0.03	< 0.01	< 0.01	< 0.01	0.11	0.3	0.66	1.03	-	1.7	10	< 1.0	10	10	10	84	55	97	5.83				
16-Mar-19	15	< 1.0	2.0	< 1.0	5.0	25	< 0.1	-	-	-	-	-	-	-	0.66	1.03	-	1.7	10	< 1.0	10	10	10	85	68	104	5.82			
16-Mar-19	15	< 1.0	2.0	< 1.0	5.0	25	< 0.1	-	-	-	-	-	-	-	0.66	1.03	-	1.7	10	< 1.0	10	10	10	85	68	104	5.82			
16-Mar-19	15	< 1.0	2.0	< 1.0	4.0	23	< 0.1	-	-	-	-	-	-	-	0.62	0.95	-	1.1	10	< 1.0	10	10	10	84	66	94	5.62			
15-Mar-19	13	< 1.0	2.0	< 1.0	2.0	20	< 0.1	-	< 0.01	0.06	< 0.01	< 0.01	0.12	0.3	0.73	0.95	-	1.84	8.0	< 1.0	10	10	10	84	66	88	5.44			
15-Mar-19	13	< 1.0	2.0	< 1.0	2.0	21	< 0.1	-	-	-	-	-	-	-	0.73	0.71	-	4.0	< 1.0	10	10	10	84	66	94	5.5				
17-Mar-19	14	< 1.0	2.0	< 1.0	3.0	23	< 0.1	-	< 0.01	< 0.01	< 0.01	0.13	0.3	0.77	1.05	-	1.1	10	< 1.0	10	10	10	84	66	77	5.67				
16-Mar-19	16	< 1	3	< 1	3	25	< 0.1	-	-	-	-	-	-	-	0.94	1.21	-	22	< 1	10	10	10	73	12	112	6.23				
26-Mar-19	14	< 1.0	2.0	< 1.0	2.0	24	< 0.1	-	< 0.01	0.02	< 0.01	0.22	0.4	0.74	0.98	-	1.98	8.0	< 1.0	10	10	10	84	66	100	5.67				
27-Mar-19	15	< 1	2	< 1	1	24	< 0.1	-	< 0.01	0.04	< 0.01	0.1	1	1	0.66	1.06	-	1.2	10	< 1	10	10	10	84	66	57	5.61			
16-Mar-19	15	< 1	2	< 1	2	27	< 0.2	-	-	-	-	-	-	-	0.66	1.26	-	2.6	10	< 1	10	10	10	84	66	91	5.91			
16-Mar-19	17	< 1	2	< 1	2	24	< 0.1	-	< 0.01	0.03	< 0.01	0.06	0.09	0.6	0.5	0.56	-	2.12	5	< 1	10	10	10	84	66	88	5.91			
16-Mar-19	13	< 1.0	2.0	< 1.0	2.0	21	< 0.1	-	-	-	-	-	-	-	0.73	0.81	-	9.0	< 1.0	10	10	10	84	66	95	5.67				
16-Mar-19	14	< 1.0	2.0	< 1.0	4.0	21	< 0.1	-	-	-	-	-	-	-	0.84	0.92	-	12	< 1	10	10	10	84	66	85	5.7				
16-Mar-19	15	< 1	2	< 1	2	27	< 0.1	-	< 0.01	0.04	< 0.01	0.1	1	1	0.66	1.06	-	2.26	10	< 1	10	10	84	66	91	5.91				
16-Mar-19	16	< 1	2	< 1	2	24	< 0.1	-	< 0.01	0.03	< 0.01	0.06	0.09	0.6	0.5	0.56	-	2.6	10	< 1	10	10	84	66	88	5.91				
16-Mar-19	16	< 1.0	2.0	< 1.0	2.0	21	< 0.1	-	-	-	-	-	-	-	0.73	0.81	-	9.0	< 1.0	10	10	10	84	66	95	5.67				
16-Mar-19	17	< 1	2	< 1	2	24	< 0.1	-	< 0.01	0.03	< 0.01	0.06	0.09	0.6	0.5	0.56	-	2.12	5	< 1	10	10	10	84	66	88	5.91			
16-Mar-19	13	< 1.0	2.0	< 1.0	2.0	21	< 0.1	-	-	-	-	-	-	-	0.73	0.81	-	9.0	< 1.0	10	10	10	84	66	95	5.67				
16-Mar-19	14	< 1.0	2.0	< 1.0	4.0	21	< 0.1	-	-	-	-	-	-	-	0.84	0.92	-	12	< 1	10	10	10	84	66	85	5.7				
16-Mar-19	15	< 1	2	< 1	2	27	< 0.1	-	< 0.01	0.04	< 0.01	0.1	1	1	0.66	1.06	-	2.26	10	< 1	10	10	84	66	91	5.91				
16-Mar-19	16	< 1	2	< 1	2	24	< 0.1	-	< 0.01	0.03	< 0.01	0.06	0.09	0.6	0.5	0.56	-	2.6	10	< 1	10	10	84	66	88	5.91				
16-Mar-19	16	< 1.0	2.0	< 1.0	2.0	21	< 0.1	-	-	-	-	-	-	-	0.73	0.81	-	9.0	< 1.0	10	10	10	84	66	95	5.67				
16-Mar-19	17	< 1	2	< 1	2	24	< 0.1	-	< 0.01	0.03	< 0.01	0.06	0.09	0.6	0.5	0.56	-	2.12	5	< 1	10	10	10	84	66	88	5.91			
16-Mar-19	13	< 1.0	2.0	< 1.0	2.0	21	< 0.1	-	-	-	-	-	-	-	0.73	0.81	-	9.0	< 1.0	10	10	10	84	66	95	5.67				
16-Mar-19	14	< 1.0	2.0	< 1.0	4.0	21	< 0.1	-	-	-	-	-	-	-	0.84	0.92	-	12	< 1	10	10	10	84	66	85	5.7				
16-Mar-19	15	< 1	2	< 1	2	27	< 0.1	-	< 0.01	0.04	< 0.01	0.1	1	1	0.66	1.06	-	2.26	10	< 1	10	10	84	66	91	5.91				
16-Mar-19	16	< 1	2	< 1	2	24	< 0.1	-	< 0.01	0.03	< 0.01	0.06	0.09	0.6	0.5	0.56	-	2.6	10	< 1	10	10	84	66	88	5.91				
16-Mar-19	16	< 1.0	2.0	< 1.0	2.0	21	< 0.1	-	-	-	-	-	-	-	0.73	0.81	-	9.0	< 1.0	10	10	10	84	66	95	5.67				
16-Mar-19	17	< 1	2	< 1	2	24	< 0.1	-	< 0.01	0.03	< 0.01	0.06	0.09	0.6	0.5	0.56	-	2.12	5	< 1	10	10	10	84	66	88	5.91			
16-Mar-19	13	< 1.0	2.0	< 1.0	2.0	21	< 0.1	-	-	-	-	-	-	-	0.73	0.81	-	9.0	< 1.0	10	10	10	84	66	95	5.67				
16-Mar-19	14	< 1.0	2.0	< 1.0	4.0	21	< 0.1	-	-	-	-	-	-	-	0.84	0.92	-	12	< 1	10	10	10	84	66	85	5.7				
16-Mar-19	15	< 1	2	< 1	2	27	< 0.1	-	< 0.01	0.04	< 0.01	0.1	1	1	0.66	1.06	-	2.26	10	< 1	10	10	84	66	91	5.91				
16-Mar-19	16	< 1	2	< 1	2	24	< 0.1	-	< 0.01	0.03	< 0.01	0.06	0.09	0.6	0.5	0.56	-	2.6	10	< 1	10	10	84	66	88	5.91				
16-Mar-19	16	< 1.0	2.0	< 1.0	2.0	21	< 0.1	-	-	-	-	-	-	-	0.73	0.81	-	9.0	< 1.0	10	10	10	84	66	95	5.67				
16-Mar-19	17	< 1	2	< 1	2	24	< 0.1	-	< 0.01	0.03	< 0.01	0.06	0.09	0.6	0.5	0.56	-	2.12	5	< 1	10	10	10	84	66	88	5.91			
16-Mar-19	13	< 1.0	2.0	< 1.0	2.0	21	< 0.1	-	-	-	-	-	-	-	0.73	0.81	-	9.0	< 1.0	10	10	10	84	66	95	5.67				
16-Mar-19	14	< 1.0	2.0	< 1.0	4.0	21	< 0.1	-	-	-	-	-	-	-	0.84	0.92	-	12	< 1	10	10	10	84	66	85	5.7				
16-Mar-19	15	< 1	2	< 1	2	27	< 0.1	-	< 0.01	0.04	< 0.01	0.1	1	1	0.66	1.06	-	2.26	10	< 1	10	10	84	66	91	5.91				
16-Mar-19	16	< 1	2	< 1	2	24	< 0.1	-	< 0.01	0.03	< 0.01	0.06	0.09	0.6	0.5	0.56	-	2.6	10	< 1	10	10	84	66	88	5.91				
16-Mar-19	16	< 1.0	2.0	< 1.0	2.0	21	< 0.1	-	-	-	-	-	-	-	0.73	0.81	-	9.0	< 1.0	10	10	10	84	66	95	5.67				
16-Mar-19	17	< 1	2	< 1	2	24	< 0.1	-	< 0.01	0.03	< 0.01	0.06	0.09	0.6	0.5	0.56	-	2.12	5	< 1	10	10	10	84	66	88	5.91			
16-Mar-19	13	< 1.0	2.0	< 1.0	2.0	21	< 0.1	-	-	-	-	-	-	-	0.73	0.81	-	9.0	< 1.0	10	10	10	84	66	95	5.67				
16-Mar-19	14	< 1.0	2.0	< 1.0	4.0	21	< 0.1	-	-	-	-	-	-	-	0.84	0.92	-	12	< 1	10	10	10	84	66	85	5.7				
16-Mar-19	15	< 1	2	< 1	2	27	< 0.1	-	< 0.01	0.04	< 0.01	0.1	1	1	0.66	1.06	-	2.26	10	< 1	10	10	84	66	91	5.91				
16-Mar-19	16																													

Table GW  
Groundwater Analytical Data - Inorganics  
Willamette Sand Syndicate

Analyte	Anions and Cations														Alkalinity										Inorganics								
	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 CaCO <sub>3</sub>	Carbonate Alkalinity as CaCO <sub>3</sub>	Hydroxide Alkalinity as CaCO <sub>3</sub>	Total Alkalinity as CaCO <sub>3</sub>	Total Hardness as CaCO <sub>3</sub>	Electrical Conductivity @ 25°C	Total Dissolved Solids	Total Dissolved Solids	pH					
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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	pH	
Baseline/Trooper Values (KLF 2020) <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
NHEC ADWG 2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Sample Date	Sample Date																																
30	<1.0	5.0	2.0	9.0	58	0.1	-	-	-	-	-	-	-	-	-	1.85	1.82	-	-	<1.0	<1.0	<1.0	<1.0	25	265	172	-	4.34	-	-			
31	<1.0	5.0	2.0	10	63	0.1	-	-	-	-	-	-	-	-	-	1.81	1.98	-	-	<1.0	<1.0	<1.0	<1.0	20	267	174	-	4.62	-	-			
34	<1.0	6.0	2.0	12	64	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	0.3	0.6	0.6	2.02	2.06	-	2.9	<1.0	<1.0	<1.0	<1.0	25	270	176	161	4.54	-	-				
35	<1.0	7.0	2.0	13	65	0.1	-	-	-	-	-	-	-	-	-	2.11	2.13	-	-	<1.0	<1.0	<1.0	<1.0	25	273	171	151	4.51	-	-			
52	<1.0	6.0	<1.0	11	90	0.1	<0.01	1.97	<0.01	<0.01	<0.01	0.5	2.4	2.4	2.76	2.77	-	4.44	<1.0	<1.0	<1.0	<1.0	25	352	258	-	4.46	-	-				
44-Mar-19	45	<1.0	6.0	6.0	76	0.1	-	-	-	-	-	-	-	-	-	2.45	2.27	-	-	<1.0	<1.0	<1.0	<1.0	25	319	207	253	4.77	-	-			
45	<1.0	7.0	2.0	13	89	0.1	-	-	-	-	-	-	-	-	-	2.50	2.08	-	-	<1.0	<1.0	<1.0	<1.0	25	324	177	145	4.53	-	-			
46-May-19	47	<1.0	4.0	<1.0	6.0	81	<0.1	<0.01	<0.01	<0.01	<0.01	0.12	0.4	0.4	2.37	2.43	-	4.86	<1.0	<1.0	<1.0	<1.0	16	302	196	354	4.9	-	-				
46-Jun-19	47	<1.0	5.0	<1.0	4.0	89	<0.1	-	-	-	-	-	-	-	-	2.46	2.59	-	-	<1.0	<1.0	<1.0	<1.0	20	315	194	4.82	-	-				
47	<1.0	5.0	<1.0	5.0	73	0.1	-	-	-	-	-	-	-	-	-	2.51	2.67	-	-	<1.0	<1.0	<1.0	<1.0	25	323	229	237	4.59	-	-			
47-Aug-19	42	<1.0	3.0	<1.0	4.0	63	<0.1	-	-	-	-	-	-	-	-	2.07	1.86	-	-	<1.0	<1.0	<1.0	<1.0	12	260	169	140	5.0	-	-			
48-Sep-19	46	<1.0	4.0	70	70	<0.1	<0.01	0.43	<0.01	<0.01	0.13	1.1	1.1	1.1	2.25	2.06	-	5.43	<1.0	<1.0	<1.0	<1.0	12	293	190	206	4.85	-	-				
49	<1.0	4.0	<1.0	4.0	70	0.1	-	-	-	-	-	-	-	-	-	2.46	2.42	-	-	<1.0	<1.0	<1.0	<1.0	16	316	205	5.12	-	-				
50	<1.0	4	<1	10	75	0.1	-	-	-	-	-	-	-	-	-	2.5	2.36	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
51	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	327	212	5.03	-	-				
52	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
53	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	327	212	5.03	-	-				
54	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
55	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
56	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
57	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
58	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
59	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
60	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
61	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
62	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
63	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
64	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
65	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
66	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
67	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
68	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
69	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
70	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
71	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
72	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
73	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
74	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
75	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
76	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
77	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
78	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
79	<1.0	4	<1	11	75	0.1	-	-	-	-	-	-	-	-	-	2.54	2.27	-	-	2	<1	<1	<1	16	328	213	5.02	-	-				
80	<1.0	4	<1	11</																													

Table SW1  
Surface Water Analytical Data - BTEXN  
Williamstown Sand Syndicate



Table SW1  
Surface Water Analytical Data - BTEXN  
Williamstown Sand Syndicate



Analyte	BTEXN								Total Petroleum Hydrocarbons	Total Petroleum Hydrocarbons - Silica Clean up			Total Recoverable Hydrocarbons	Total Recoverable Hydrocarbons - Silica Clean up					
	Benzene **	Toluene	Ethylbenzene	meta- & para-Xylene	ortho-Xylene* *	Total Xylenes	Naphthalene**	Sum of BTEX		C <sub>10</sub> -C <sub>14</sub> - Silica Cleanup	C <sub>15</sub> -C <sub>28</sub> - Silica Cleanup	C <sub>29</sub> -C <sub>36</sub> - Silica Cleanup	C <sub>10</sub> -C <sub>36</sub> Sum - Silica Cleanup	C <sub>6</sub> - C <sub>10</sub>	C <sub>6</sub> - C <sub>10</sub> minus BTEX (F1)	>C <sub>10</sub> -C <sub>16</sub> - Silica Cleanup	F2 - Silica Cleanup	>C <sub>16</sub> -C <sub>34</sub> - Silica Cleanup	>C <sub>34</sub> -C <sub>40</sub> - Silica Cleanup
LOR	1	2	2	2	2	2	5	1	20	50	100	50	50	20	20	100	100	100	100
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Baseline Trigger Values (KLF, 2020)	-	-	-	-	-	-	-	-	-	-	-	-	-	20	20	100	-	100	100
NHMRC ADWG 2018	1	800	300	-	350	600	-	-	-	-	-	-	-	-	-	-	-	-	-
Sample Name	Sample Date																		
SW3	17-Dec-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	16-Jan-20																		
	27-Feb-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	26-Mar-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	27-Apr-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	15-May-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	19-Jun-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	16-Jul-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	14-Aug-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	16-Sep-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	16-Oct-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	16-Nov-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	16-Dec-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	14-Jan-21	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	16-Feb-21	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	17-Mar-21	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
SW4	22-Feb-19								Dry										
	14-Mar-19																		
	23-Apr-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	16-May-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	14-Jun-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	16-Jul-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	15-Aug-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	16-Sep-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	15-Oct-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	18-Nov-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	17-Dec-19								Dry										
	16-Jan-20																		
	27-Feb-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	26-Mar-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	27-Apr-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	15-May-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	19-Jun-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	16-Jul-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	14-Aug-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	16-Sep-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	16-Oct-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	16-Nov-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	16-Dec-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	14-Jan-21	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	16-Feb-21	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100
	17-Mar-21	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100

**Notes:**

- Not analysed

< - Less than laboratory limit of reporting

ug/L - Micrograms per litre

BTEXN - Benzene, toluene, ethylbenzene, xylenes, naphthalene

1- Baseline Water Quality Summary Report, September 2020 (KLF 2020)

\*\* 95% Level of protection in freshwater

Table SW2  
Surface Water Analytical Data - Metals  
Williamstown Sand Syndicate

Analyte	Metals																
	Arsenic**	Barium	Beryllium	Boron**	Cadmium**	Chromium** <sup>1</sup>	Cobalt	Copper**	Iron	Lead**	Manganese**	Mercury** <sup>2</sup>	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	
Baseline Trigger Values (KLF 2020) <sup>3</sup>	0.001	0.08	-	0.14 (SW1)/ 0.05 (SW3 & SW4)	-	0.002	0.017	0.013	9.26	-	0.841 (SW1)/0.048 (SW3 & SW4)	-	0.022	-	-	0.535 (SW1) / 0.085 (SW3 & SW4)	
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	22-Feb-19															
SW1	14-Mar-19	Dry															
	23-Apr-19	< 0.001	0.043	< 0.001	0.14	< 0.0001	< 0.001	0.017	0.002	4.16	< 0.001	0.841	< 0.0001	0.02	< 0.01	< 0.01	
	16-May-19	< 0.001	0.029	< 0.001	0.1	< 0.0001	< 0.001	0.01	0.003	7.25	< 0.001	0.666	< 0.0001	0.012	< 0.01	< 0.01	
	14-Jun-19	< 0.001	0.029	< 0.001	0.09	0.0002	< 0.001	0.009	0.006	2.75	< 0.001	0.595	< 0.0001	0.011	< 0.01	< 0.01	
	16-Jul-19	< 0.001	0.032	< 0.001	0.08	0.0001	< 0.001	0.007	0.003	1.86	< 0.001	0.59	< 0.0001	0.008	< 0.01	0.239	
	15-Aug-19	< 0.001	0.027	< 0.001	0.09	< 0.0001	< 0.001	0.005	0.003	2.15	< 0.001	0.482	< 0.0001	0.005	< 0.01	0.075	
	16-Sep-19	< 0.001	0.056	< 0.001	0.09	0.0002	0.001	0.008	0.012	2.45	0.001	0.587	< 0.0001	0.014	< 0.01	< 0.01	
	15-Oct-19	< 0.001	0.036	< 0.001	0.07	< 0.0001	< 0.001	0.005	0.003	1.61	< 0.001	0.383	< 0.0001	0.005	< 0.01	0.055	
	18-Nov-19	< 0.001	0.042	< 0.001	0.11	< 0.0001	0.001	0.003	< 0.001	1.14	< 0.001	0.366	< 0.0001	0.003	< 0.01	0.026	
	17-Dec-19																
	16-Jan-20	Dry															
	27-Feb-20	0.002	0.029	< 0.001	0.06	< 0.0001	0.006	0.002	0.026	1.67	0.002	0.211	< 0.0001	0.009	< 0.01	< 0.01	
	26-Mar-20	0.002	0.013	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.011	0.1	0.001	0.018	< 0.0001	0.005	< 0.01	< 0.01	
	27-Apr-20	< 0.001	-	-	-	< 0.0001	0.004	-	0.016	0.2	0.003	0.012	< 0.0001	-	-	0.041	
	15-May-20	< 0.001	0.008	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.018	0.15	0.001	0.014	< 0.0001	0.005	< 0.01	< 0.01	
	19-Jun-20	< 0.001	-	-	-	< 0.0001	< 0.001	-	0.01	0.17	0.001	0.011	< 0.0001	-	-	0.042	
	16-Jul-20	< 0.001	-	-	-	< 0.0001	< 0.001	-	0.002	< 0.5	< 0.001	0.003	< 0.0001	-	-	< 0.005	
	14-Aug-20	< 0.001	0.016	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.006	0.18	< 0.001	0.01	< 0.0001	< 0.001	< 0.01	0.063	
	16-Sep-20	< 0.001	0.021	< 0.001	< 0.05	< 0.0001	< 0.001	0.001	0.005	0.87	0.001	0.096	< 0.0001	0.002	< 0.01	< 0.01	
	16-Oct-20	0.001	0.021	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.001	0.76	< 0.001	0.15	< 0.0001	0.001	< 0.01	0.005	
	16-Nov-20	< 0.001	0.02	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.005	0.18	< 0.001	0.017	< 0.0001	< 0.001	< 0.01	0.03	
	16-Dec-20	< 0.001	0.015	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.003	0.18	< 0.001	0.058	< 0.0001	< 0.001	< 0.01	0.013	
	14-Jan-21	< 0.001	0.012	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.02	0.35	< 0.001	0.04	< 0.0001	0.006	< 0.01	0.037	
	16-Feb-21	< 0.001	0.011	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.12	< 0.001	0.028	< 0.0001	< 0.001	< 0.01	< 0.01	0.024	
	17-Mar-21	< 0.001	0.013	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	0.16	< 0.001	0.036	< 0.0001	< 0.001	< 0.01	< 0.01	0.04	
SW2	22-Feb-19	Dry															
	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
SW2	22-Feb-19	0.003	0.075	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	4.84	< 0.001	0.033	< 0.0001	0.002	< 0.01	< 0.01	0.016	
	14-Mar-19	0.006	0.08	< 0.001	< 0.05	< 0.0001	< 0.001	0.003	< 0.001	9.26	< 0.001	0.048	< 0.0001	0.002	< 0.01	< 0.01	0.009
	23-Apr-19	< 0.001	0.043	< 0.001	< 0.05	< 0.0001	< 0.001	0.003	0.001	2.01	< 0.001	0.046	< 0.0001	0.004	< 0.01	< 0.01	0.016
	16-May-19	< 0.001	0.034	< 0.001	< 0.05	< 0.0001	< 0.001	0.002	< 0.001	1.78	< 0.001	0.038	< 0.0001	0.003	< 0.01	< 0.01	0.012
	14-Jun-19	< 0.001	0.035	< 0.001	< 0.05	< 0.0001	< 0.001	0.001 *	0.003	< 0.001	1.68	< 0.001	0.038	< 0.0001	0.003	< 0.01	0.016
	16-Jul-19	< 0.001	0.055	< 0.001	< 0.05	< 0.0001	< 0.001	0.007	0.002	1.25	< 0.001	0.043	< 0.0001	0.006	< 0.01	< 0.01	0.029
	15-Aug-19	< 0.001	0.035	< 0.001	< 0.05	< 0.0001	< 0.001	0.003	0.002	1.16	< 0.001	0.036	< 0.0001	0.003	< 0.01	< 0.01	0.013
	16-Sep-19	< 0.001	0.045	< 0.001	< 0.05	< 0.0001	< 0.001	0.004	0.002	0.69	0.001	0.036	< 0.0001	0.017	< 0.01	< 0.01	0.094
	15-Oct-19	< 0.001	0.034	< 0.001	< 0.05	< 0.0001	< 0.001	0.005	0.002	1.7	< 0.001	0.027	< 0.0001	0.005	< 0.01	< 0.01	0.022
	18-Nov-19	< 0.001	0.031	< 0.001	< 0.05	< 0.0001	0.001	0.003	< 0.001	2.6	< 0.001	0.026	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005
	17-Dec-19	< 0.001	0.041	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.003	1.42	< 0.001	0.026	< 0.0001	0.001	< 0.01	< 0.01	< 0.005

Table SW2  
Surface Water Analytical Data - Metals  
Williamstown Sand Syndicate



Analyte	Metals																
	Arsenic**	Barium	Beryllium	Boron**	Cadmium**	Chromium** <sup>1</sup>	Cobalt	Copper**	Iron	Lead**	Manganese**	Mercury** <sup>2</sup>	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	
Baseline Trigger Values (KLF 2020) <sup>3</sup>	0.001	0.08	-	0.14 (SW1)/0.05 (SW3 & SW4)	-	0.002	0.017	0.013	9.26	-	0.841 (SW1)/0.048 (SW3 & SW4)	-	0.022	-	-	0.535 (SW1)/0.085 (SW3 & SW4)	
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																
SW3	16-Jan-20								Dry								
	27-Feb-20	<b>0.002</b>	<b>0.051</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.006</b>	<b>0.008</b>	<b>6</b>	<0.001	<b>0.054</b>	<0.0001	<b>0.01</b>	<0.01	<0.01	<b>0.049</b>
	26-Mar-20	<b>0.001</b>	<b>0.041</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.001</b>	<b>0.013</b>	<b>4.01</b>	<0.001	<b>0.035</b>	<0.0001	<b>0.006</b>	<0.01	<0.01	<b>0.033</b>
	27-Apr-20	<b>0.001</b>	-	-	-	<0.0001	<0.001	-	<b>0.006</b>	<b>4.01</b>	0.003	<b>0.034</b>	<0.0001	-	-	-	<b>0.031</b>
	15-May-20	<0.001	<b>0.038</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.001</b>	<b>0.02</b>	<b>0.87</b>	<0.001	<b>0.036</b>	<0.0001	<b>0.007</b>	<0.01	<0.01	<b>0.037</b>
	19-Jun-20	<0.001	-	-	-	<b>0.0001</b>	<0.001	-	<b>0.015</b>	<b>2.9</b>	<b>0.001</b>	<b>0.04</b>	<0.0001	-	-	-	<b>0.092</b>
	16-Jul-20	<0.001	-	-	-	<b>0.0001</b>	<b>0.001</b>	-	<b>0.006</b>	<b>1.6</b>	<0.001	<b>0.036</b>	<0.0001	-	-	-	<b>0.043</b>
	14-Aug-20	<0.001	<b>0.024</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.004</b>	<b>0.001</b>	<b>4.28</b>	<0.001	<b>0.034</b>	<0.0001	<b>0.005</b>	<0.01	<0.01	<b>0.025</b>
	16-Sep-20	<0.001	<b>0.034</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.007</b>	<b>0.007</b>	<b>3.49</b>	<0.001	<b>0.029</b>	<0.0001	<b>0.007</b>	<0.01	<0.01	<b>0.031</b>
	16-Oct-20	<0.001	<b>0.028</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.004</b>	<b>0.003</b>	<b>7.09</b>	<0.001	<b>0.027</b>	<0.0001	<b>0.004</b>	<0.01	<0.01	<b>0.019</b>
	16-Nov-20	<0.001	<b>0.029</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.009</b>	<b>0.002</b>	<b>4.79</b>	<0.001	<b>0.032</b>	<0.0001	<b>0.009</b>	<0.01	<0.01	<b>0.03</b>
	16-Dec-20	<b>0.002</b>	<b>0.015</b>	<0.001	<0.05	<0.0001	<b>0.001</b>	<b>0.002</b>	<b>0.005</b>	<b>16</b>	<0.001	<b>0.023</b>	<0.0001	<b>0.004</b>	<0.01	<0.01	<b>0.054</b>
	14-Jan-21	<b>0.002</b>	<b>0.015</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.004</b>	<b>0.02</b>	<b>8.28</b>	<0.001	<b>0.026</b>	<0.0001	<b>0.01</b>	<0.01	<0.01	<b>0.025</b>
	16-Feb-21	<b>0.004</b>	<b>0.014</b>	<0.001	<0.05	<0.0001	<b>0.002</b>	<b>0.003</b>	<b>0.001</b>	<b>11</b>	<0.001	<b>0.015</b>	<0.0001	<b>0.004</b>	<0.01	<0.01	<b>0.011</b>
	17-Mar-21	<b>0.004</b>	<b>0.013</b>	<0.001	<0.05	<0.0001	<b>0.001</b>	<b>0.002</b>	<0.001	<b>12</b>	<0.001	<b>0.016</b>	<0.0001	<b>0.003</b>	<0.01	<0.01	<b>0.007</b>
SW4	22-Feb-19								Dry								
	14-Mar-19																
	23-Apr-19	<0.001	<b>0.059</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.003</b>	<b>0.003</b>	<b>2.09</b>	<0.001	<b>0.037</b>	<0.0001	<b>0.005</b>	<0.01	<0.01	<b>0.03</b>
	16-May-19	<0.001	<b>0.047</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.002</b>	<0.001	<b>1.12</b>	<0.001	<b>0.03</b>	<0.0001	<b>0.003</b>	<0.01	<0.01	<b>0.019</b>
	14-Jun-19	<0.001	<b>0.041</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.002</b>	<b>0.003</b>	<b>0.79</b>	<0.001	<b>0.034</b>	<0.0001	<b>0.003</b>	<0.01	<0.01	<b>0.014</b>
	16-Jul-19	<0.001	<b>0.044</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.002</b>	<b>0.002</b>	<b>0.96</b>	<0.001	<b>0.043</b>	<0.0001	<b>0.003</b>	<0.01	<0.01	<b>0.014</b>
	15-Aug-19	<0.001	<b>0.04</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.001</b>	<b>0.001</b>	<b>0.57</b>	<0.001	<b>0.032</b>	<0.0001	<b>0.002</b>	<0.01	<0.01	<b>0.009</b>
	16-Sep-19	<0.001	<b>0.046</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.002</b>	<b>0.02</b>	<b>0.7</b>	<b>0.001</b>	<b>0.039</b>	<0.0001	<b>0.017</b>	<0.01	<0.01	<b>0.085</b>
	15-Oct-19	<0.001	<b>0.037</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.002</b>	<b>0.004</b>	<b>0.66</b>	<0.001	<b>0.031</b>	<0.0001	<b>0.003</b>	<0.01	<0.01	<b>0.018</b>
	18-Nov-19	<0.001	<b>0.035</b>	<0.001	<0.05	<0.0001	<0.001	<0.001	<0.001	<b>6.32</b>	<0.001	<b>0.032</b>	<0.0001	<b>0.002</b>	<0.01	<0.01	<0.005
	17-Dec-19																
	16-Jan-20																
	27-Feb-20	<0.001	<b>0.054</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.002</b>	<b>0.018</b>	<b>2.52</b>	<0.001	<b>0.05</b>	<0.0001	<b>0.009</b>	<0.01	<0.01	<b>0.06</b>
	26-Mar-20	<0.001	<b>0.046</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.001</b>	<b>0.007</b>	<b>1.97</b>	<0.001	<b>0.039</b>	<0.0001	<b>0.003</b>	<0.01	<0.01	<b>0.034</b>
	27-Apr-20	<0.001	-	-	-	<0.0001	<0.001	-	<b>0.017</b>	<b>1.82</b>	<0.001	<b>0.04</b>	<0.0001	-	-	-	<b>1.82</b>
	15-May-20	<0.001	<b>0.039</b>	<0.001	<0.05	<0.0001	<0.001	<0.001	<b>0.033</b>	<b>0.62</b>	<0.001	<b>0.038</b>	<0.0001	<b>0.005</b>	<0.01	<0.01	<b>0.038</b>
	19-Jun-20	<0.001	-	-	-	<0.0001	<0.001	-	<b>0.015</b>	<b>1.03</b>	<b>0.001</b>	<b>0.06</b>	<0.0001	-	-	-	<b>0.063</b>
	16-Jul-20	<0.001	-	-	-	<0.0001	<b>0.001</b>	-	<b>0.008</b>	<b>0.8</b>	<0.001	<b>0.059</b>	<0.0001	-	-	-	<b>0.043</b>
	14-Aug-20	<0.001	<b>0.043</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.007</b>	<0.001	<b>0.95</b>	<0.001	<b>0.087</b>	<0.0001	<b>0.007</b>	<0.01	<0.01	<b>0.04</b>
	16-Sep-20	<0.001	<b>0.041</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.004</b>	<b>0.005</b>	<b>0.97</b>	<0.001	<b>0.053</b>	<0.0001	<b>0.005</b>	<0.01	<0.01	<b>0.02</b>
	16-Oct-20	<0.001	<b>0.03</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.002</b>	<b>0.001</b>	<b>2.26</b>	<0.001	<b>0.042</b>	<0.0001	<b>0.003</b>	<0.01	<0.01	<b>0.007</b>
	16-Nov-20	<0.001	<b>0.031</b>	<0.001	<0.05	<0.0001	<0.001	<b>0.004</b>	<b>0.001</b>	<b>1.93</b>	<0.001	<b>0.074</b>	<0.0001	<b>0.005</b>	<0.01	<0.01	<b>0.016</b>
	16-Dec-20	<0.001	<b>0.017</b>	<0.001	<0.05	<0.0001	<b>0.002</b>	<b>0.001</b>	<b>0.002</b>	<b>32</b>	<0.001	<b>0.035</b>	<0.0001	<b>0.002</b>	<0.01	<0.01	<0.005
	14-Jan-21	<b>0.002</b>	<b>0.028</b>	<0.001	<0.05	<0.0001	<b>0.002</b>	<b>0.003</b>	<b>0.026</b>	<b>20</b>	<0.001	<b>0.171</b>	<0.0001	<b>0.005</b>	<0.01	<0.01	<b>0.013</b>
	16-Feb-21	<b>0.003</b>	<b>0.02</b>	<0.001	<0.05	<0.0001	<b>0.003</b>	<b>0.001</b>	<0.001	<b>27</b>	<0.001	<b>0.054</b>	<0.0001	<b>0.002</b>	<0.01	<0.01	<b>0.01</b>
	17-Mar-21	<b>0.002</b>	<b>0.02</b>	<0.001	<0.05	<0.0001	<b>0.002</b>	<0.001	<0.001	<b>16</b>	<0.001	<b>0.057</b>	<0.0001	<0.001	<0.01	<0.01	<0.005

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

<sup>1</sup> value for CR VI

<sup>2</sup> as inorganic

### Notes:

**Notes:**

< - Less than laboratory limit of report

**µg/L - Micrograms per litre**

\*\*\* 99% Level of

<sup>1</sup> Criteria is LOR

2- Denotes duplicate value used.

3- Denotes triplicate

#### <sup>4</sup> Recreation water

Notes

**Notes:**

< - Less than laboratory limit

$\mu\text{g/L}$  - Micrograms per litre

\*\*\* 99% Level of protection

<sup>1</sup> Criteria is LOR

- 2- Denotes duplicate value
- 3- Denotes triplets of values

<sup>4</sup> Recreational water.

#### • Recreation water

Table SW4  
Groundwater Analytical Data - Inorganics  
Williamtown Sand Syndicate



Analyte	Anions and Cations														Alkalinity										Inorganics						
	Sodium	Calcium	Magnesium	Potassium	Sulphate	Chloride	Fluoride	Reactive phosphorus 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	Total Alkalinity as CaCO3	Total Hardness as CaCO3	Electrical Conductivity at 25°C	Total Dissolved Solids	pH					
LOR	1	1	1	1	1	0.1	0.01	0.01	0.01	0.01	0.01	0.01	0.1	0.1	0.01	0.01	1	1	1	1	1	1	1	1	10	10	10				
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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm	mg/L	mg/L				
Baseline Trigger Values (KLF 2020)*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Sample Name	Sample Date														Sample Date																
Baseline Trigger Values (KLF 2020)*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Sample Name	Sample Date														Sample Date																
22-Feb-19	14	34	1	1	1	1	0.1	0.01	0.01	< 0.01	0.13	< 0.01	< 0.01	< 0.01	0.13	< 0.01	0.13	1.8	8.9	9.9	5.13	2.45	1.0	< 1.0	< 1.0	233	947	616	715	4.01	
13-Apr-19	94	34	52	6.0	310	95	0.5	< 0.01	0.13	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.13	< 0.01	0.13	10	9.13	5.6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	299	893	580	707	4.01	
16-May-19	86	24	42	6.0	324	115	0.3	< 0.01	0.13	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.13	< 0.01	0.13	10	8.94	9.9	5.13	2.45	1.0	< 1.0	< 1.0	< 1.0	233	947	616	715	4.01
17-Jun-19	77	24	34	6.0	310	115	0.4	< 0.01	0.13	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.13	< 0.01	0.13	10	7.29	6.59	4.10	1.40	0.60	< 1.0	< 1.0	< 1.0	233	947	616	715	4.01
16-Jul-19	90	20	35	4.0	240	130	0.4	< 0.01	0.13	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.13	< 0.01	0.13	7.95	8.66	4.64	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	194	876	569	568	4.42	
15-Aug-19	97	18	32	4.0	212	134	0.4	< 0.01	0.13	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.13	< 0.01	0.13	7.85	8.19	2.12	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	177	813	528	548	4.53	
15-Sep-19	101	18	32	4.0	212	134	0.4	< 0.01	0.13	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.13	< 0.01	0.13	7.85	8.19	2.12	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	177	813	528	548	4.53	
15-Oct-19	124	16	31	3.0	170	127	0.5	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	1.2	1.2	1.2	0.82	0.49	0.39	< 1.0	< 1.0	168	1050	632	741	3.32	
18-Nov-19	142	14	30	4.0	165	234	0.5	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.03	< 0.01	0.03	1.1	9.45	10	3.03	4.91	< 1.0	< 1.0	< 1.0	158	1,090	570	708	-	
17-Dec-19	10	15	2.0	2.0	1.0	1.0	0.1	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	1.0	1.0	1.0	1.0	1.0	< 1.0	< 1.0	< 1.0	158	1,090	570	708	-	
27-Feb-20	56	34	10	8.0	73	64	0.4	< 0.01	0.17	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.16	< 0.05	0.17	2.4	5.16	4.58	5.91	2.17	63	< 1.0	< 1.0	63	126	550	358	-	6.83
26-Mar-20	12	27	2	4.0	6.0	11	0.1	< 0.01	0.17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.17	< 0.01	0.17	2.4	2.14	1.45	1.0	1.0	51	< 1.0	< 1.0	51	76	234	152	-	7.09
17-Apr-20	12	14	1	5.0	18	12	0.3	< 0.01	0.17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.17	< 0.01	0.17	2.4	1.98	1.51	1.0	1.0	40	< 1.0	< 1.0	40	36	163	106	-	6.94
15-May-20	9.0	18	1.0	1.0	19	1.0	0.1	< 0.01	0.17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.17	< 0.01	0.17	2.4	1.98	1.51	1.0	1.0	40	< 1.0	< 1.0	40	36	163	106	-	6.94
19-Jun-20	7.0	21	1.0	2.0	8.0	7.0	0.1	< 0.01	0.17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.17	< 0.01	0.17	2.4	1.48	1.52	1.0	1.0	58	< 1.0	< 1.0	58	56	159	103	-	6.68
16-Jul-20	7.0	16	1.0	2.0	6.0	7.0	0.1	< 0.01	0.17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.17	< 0.01	0.17	2.4	1.24	1.34	1.0	1.0	51	< 1.0	< 1.0	51	44	133	133	-	6.89
14-Aug-20	9.0	16	3.0	3.0	1.0	1.0	0.1	< 0.01	0.17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.17	< 0.01	0.17	2.4	0.80	0.84	0.49	0.49	51	< 1.0	< 1.0	51	38	133	133	-	6.89
16-Sep-20	9.0	16	3.0	3.0	1.0	1.0	0.1	< 0.01	0.17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.17	< 0.01	0.17	2.4	1.51	1.1	0.55	0.55	55	< 1.0	< 1.0	55	53	154	100	-	6.71
14-Oct-20	12	40	4.0	4.0	2.0	2.0	0.2	< 0.01	0.17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.17	< 0.01	0.17	2.4	2.95	2.69	1.12	1.0	112	< 1.0	< 1.0	112	116	268	174	-	7.29
16-Nov-20	10	19	2.0	3.0	5.0	12	0.1	< 0.01	0.17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.17	< 0.01	0.17	2.4	1.62	1.68	0.54	0.54	62	< 1.0	< 1.0	62	56	171	111	-	7.01
14-Dec-20	10	18	2.0	3.0	< 1.0	13	0.1	< 0.01	0.17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.17	< 0.01	0.17	2.4	1.57	1.46	0.55	0.55	55	< 1.0	< 1.0	55	53	154	100	-	6.71
16-Feb-21	10	15	2.0	2.0	< 1.0	13	0.1	< 0.01	0.17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.17	< 0.01	0.17	2.4	1.44	1.28	0.50	0.50	45	< 1.0	< 1.0	45	46	139	90	-	6.63
23-Apr-19	16	34	1	1	1	1	0.1	< 0.01	0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	0.01	0.79	0.58	-	-	-	< 1.0	< 1.0	< 1.0	< 1.0	13	83	54	-	5.08
16-May-19	40	4.0	4.0	1.0	16	82	< 0.1	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.16	< 0.01	0.06	1.0	2.95	2.87	3.38	11	< 1.0	< 1.0	11	26	262	228	-	6.21	
14-Jun-19	57	24	2.0	2.0	44	64	< 0.1	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.16	< 0.01	0.06	1.0	2.14	1.45	4.0	< 1.0	< 1.0	40	44	344	224	-	5.42		
15-Jul-19	57	24	2.0	2.0	44	64	< 0.1	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.16	< 0.01	0.06	1.0	2.13	2.11	3.27	11	< 1.0	< 1.0	11	26	220	143	-	5.42	
16-Aug-19	35	7.0	5.0	< 1.0	34	54	0.4	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.1	< 0.01	0.06	2.28	2.28	2.25	2.47	1.0	< 1.0	< 1.0	1.0	38	271	176	300	5.24	
14-Sep-19	32	7.0	6.0	< 1.0	41	55	0.4	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.1	< 0.01	0.06	2.24	2.24	2.24	2.41	1.0	< 1.0	< 1.0	< 1.0	42	300	195	170	4.58	
15-Oct-19	40	7.0	6.0	< 1.0	40	55	0.4	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.1	< 0.01	0.06	2.27	2.27	2.25	2.47	1.0	< 1.0	< 1.0	< 1.0	40	267	165	145	4.58	
15-Nov-19	38	8	6	< 1.0	73	56	0.4	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.1	< 0.01	0.06	2.71	3.1	-	-	2.27	< 1.0	< 1.0	< 1.0	33	437	284	-	4.6	
16-Dec-19	34	6	6	< 1.0	50	49	0.1	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.1	< 0.01	0.06	2.39	2.42	-	-	2.27	< 1.0	< 1.0	< 1.0	33	326	212	-	4.87	
27-Apr-20	35	4	5	1	38	47	0.2	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.1	< 0.01	0.06	2.16	2.12	-	-	2.16	< 1.0	< 1.0	< 1.0	30	321	209	-	4.87	
15-May-20	36	6	5	1	35	54	0.1	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.1	< 0.01	0.06	2.17	2.31	2.41	3	< 1.0	< 1.0	< 1.0	30	294	191	-	5.12		
14-Jun-20	44	6	6	1	35	54	0.1	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.1	< 0.01	0.06	2.17	2.31	2.41	3	< 1.0	< 1.0	<							

**Notes:**

-- Not analysed

< - Less than laboratory limit of reporting

LOR - Laboratory limit of report  
mg/l - Millions per litre

µS/cm - Microsiemens per centimetre

**Bold** indicates a detection above the laboratory limit of reporting.

<sup>1</sup> Baseline Water Quality Summary Report, September 2020 (KLF 2020)

Table QC1  
Quality Control Sample Analysis - BTEXN  
Williamstown Sand Syndicate



Table QC1  
Quality Control Sample Analysis - BTEXN  
Williamtown Sand Syndicate



**Notes:**

- - Not analysed
- < - Less than laboratory limit of reporting
- NC - Not calculated
- µg/l - Micrograms per litre
- BTEX - Benzene, toluene, ethylbenzene, xylenes, naphthalene



Table QC2  
Quality Control Sample Analysis - Metals  
Williamstown Sand Syndicate



QW34_140121	14-Jan-21	Duplicate	0.001	0.028	< 0.001	< 0.05	< 0.0001	< 0.001	0.003	< 0.001	22	< 0.001	0.176	< 0.0001	0.002	< 0.01	< 0.01	< 0.005
		Relative Percentage Difference	<b>67%</b>	0%	NC	NC	NC	<b>67%</b>	0%	<b>185%</b>	11%	NC	3%	<b>66%</b>	NC	<b>89%</b>	NC	<b>89%</b>
SWA_140121	14-Jan-21	Primary	0.002	0.028	< 0.001	< 0.05	< 0.0001	0.002	0.003	0.026	20	< 0.001	0.171	< 0.0001	0.005	< 0.01	< 0.01	0.013
QW35_140121	14-Jan-21	Triplicate	0.002	0.03	< 0.001	< 0.05	< 0.0002	0.002	0.004	< 0.001	25	< 0.001	0.19	< 0.0001	0.004	-	< 0.005	< 0.005
		Relative Percentage Difference	0%	7%	NC	NC	NC	0%	29%	<b>185%</b>	22%	NC	11%	NC	22%	NC	NC	<b>89%</b>
QW38_160221	16-Feb-21	Rinsate	< 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
QW39_160221	16-Feb-21	Rinsate	< 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
SWA_160221	16-Feb-21	Primary	0.003	0.02	< 0.001	< 0.05	< 0.0001	0.003	0.001	< 0.001	27	< 0.001	0.054	< 0.0001	0.002	< 0.01	< 0.01	0.01
QW34_160221	16-Feb-21	Duplicate	0.003	0.019	< 0.001	< 0.05	< 0.0001	0.004	0.001	< 0.001	27	< 0.001	0.054	< 0.0001	0.002	< 0.01	< 0.01	0.01
		Relative Percentage Difference	0%	5%	NC	NC	NC	0%	29%	0%	NC	0%	NC	0%	NC	0%	NC	22%
SWA_160221	16-Feb-21	Primary	0.003	0.02	< 0.001	< 0.05	< 0.0001	0.003	0.001	< 0.001	27	< 0.001	0.054	< 0.0001	0.002	< 0.01	< 0.01	0.01
QW35_16022021	16-Feb-21	Triplicate	0.004	< 0.02	< 0.001	< 0.05	< 0.0002	0.003	0.002	0.002	32	< 0.001	0.065	< 0.0001	< 0.001	-	0.012	0.005
		Relative Percentage Difference	29%	0%	NC	NC	NC	0%	<b>67%</b>	<b>67%</b>	17%	NC	18%	NC	<b>67%</b>	NC	18%	<b>67%</b>
QW40_170321	17-Mar-21	Trip Blank	< 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
QW41_170321	17-Mar-21	Rinsate	< 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

**Notes:**

- - Not analysed  
< - Less than laboratory limit of reporting  
NC - Not Calculated  
mg/L - Milligrams per litre  
Half the laboratory limit of reporting used when calculating RPD  
RPD - Relative Percentage Difference

Table QC3  
Quality Control Sample Analysis - PFAG  
Wittenauer Sand Syndicate



**Notes:**  
< - Less than laboratory limit of reporting  
N/A - Not calculated  
n.d.l. - Microorganisms not listed

	Borehole	Top of Casing (mAHD)	Depth to Water (mTOC)	Groundwater Elevation (mAHD)	Well Total Depth at point of sampling (mTOC)	Time	Temp (°C)	EC (us/cm)	pH	Redox (mV)	Comment
Feb-19	BH1	8.64	5.776	2.864	8.89						No water sample taken due to top of well casing being melted.
Mar-19	BH1	8.64	6.145	2.495	8.12	830	18.93	111	5.49	81	Well recently reinstated. Strong acrylic odour when gauging. Light brown in colour.
Apr-19	BH1	8.64	6.277	2.495	8.12	1315	21.41	87	5.48	91.9	Well in good condition, will require well end cap. Slightly cloudy, no apparent odour
May-19	BH1	8.64	6.319	2.321	8.12	1220	20.57	150	5.42	25.6	Very light brown, no odour.
Jun-19	BH1	8.64	6.375	2.265	8.12	1230	19.97	111	6.43	33.6	Clear, no odour.
Jul-19	BH1	8.64	6.373	2.267	8.12	1145	18.4	122	5.42	51	Slightly cloudy, no apparent odour
Aug-19	BH1	8.64	6.453	2.187	8.12	1145	19.69	165	5.47	103	Slightly cloudy, slight sulfur odour
Sep-19	BH1	8.64	6.428	2.212	8.28	1130	21.02	125	5.43	101	Slightly cloudy brown, no odour
Oct-19	BH1	8.64	6.427	2.213	8.28	1140	21.12	18	5.5	78	Slightly cloudy brown, no odour
Nov-19	BH1	8.64	6.432	2.208	8.28	1350	21.56	182	5.43	67.3	Cloudy brown, sulfur odour
Dec-19	BH1	8.64	6.558	2.028	8.28	1225	20.53	163	6.12	15.2	Slight cloudy brown, no odour
Jan-20	BH1	8.64	6.701	1.939	8.28	1145	22.52	123	5.39	27.7	Slight cloudy brown, no odour
Feb-20	BH1	8.64	6.701	1.939	8.28	1145	22.52	123	5.39	27.7	Slight cloudy brown, no odour
Mar-20	BH1	8.64	6.701	1.939	8.28	1145	22.52	123	5.39	27.7	Slight cloudy brown, no odour
Apr-20	BH1		6.08		8.28		20	126.2	5.34	122.4	
May-20	BH1	8.64	6.842	1.798	8.28	1145	19.1	132.3	5.21	135.3	Slight cloudy brown, no odour
Jun-20	BH1	8.64	6.865	1.775	8.28	1145	19.3	121.2	5.29	118.5	Clear, no odour
Jul-20	BH1	8.64	6.958	1.682	8.28		17.6	108	5.4	135	Clear, no odour
Aug-20	BH1	8.64	6.165	2.475	8.22		18.61	273.4	4.89	278.4	Clear, no odour
Sep-20	BH1	8.64	6.216	2.424	8.22		20.44	103	5	220	Clear, no odour
Oct-20	BH1	8.64	6.329	2.311	9.45		19.1	119.7	4.84	198.5	Clear, no odour
Nov-20	BH1	8.64	6.075	2.565	9.45		24.23	348	5.43	131.1	Clear, no odour
Dec-20	BH1	8.64	6.181	2.459	9.45		22.6	233	5.62	70.1	Clear, no odour
Jan-21	BH1	8.64	6.107	2.533	9.45		21.6	308	6.1	-65.1	Clear, sulphur odour
Feb-21	BH1	8.64				1300	21.1	345	5.96	51.8	clear, sulfur odour
Mar-21	BH1	8.64	5.923	2.717		1300	21	152	5.84	-18	Clear, no odour
Feb-19	BH2*	7.79	5.674	2.116	8.93	1030	22.7	124.1	4.29	111	Slightly Cloudy, light brown, slight sulfur odour.
Mar-19	BH2	7.79	5.184	2.606	8.93	915	19.35	101	4.49	264	Dark brown - No Odour.
Apr-19	BH2	7.79	5.833	1.957	9.02	1245	22.9	87	4.59	308	Dark brown to black, no odour
May-19	BH2	7.79	5.86	1.93	9.02	1200	21.13	124	4.56	111	Dark brown, no odour
Jun-19	BH2	7.79	8.852	-1.062	9.02	1215	20.84	77	6.41	255	Very cloudy, dark brown, no odour
Jul-19	BH2	7.79	5.083	2.707	9.02	1130	18.3	124.5	4.76	88	Dark, cloudy, no odour
Aug-19	BH2	7.79	5.888	1.902	9.02	1120	19.66	136	4.7	275	Silty Base, dark brown, no odour
Sep-19	BH2	7.79	5.796	1.994	9.08	1100	21.61	111	4.7	263	Dark brown, slight sulfur odour
Oct-19	BH2	7.79	5.769	2.021	9.03	1115	20.76	48	4.83	223	Dark brown, slight sulfur odour
Nov-19	BH2	7.79	5.721	2.069	9.03	1330	21.76	133	4.61	230	Dark brown, slight sulfur odour
Dec-19	BH2	7.79	5.936	1.854	9.03	1200	20.13	131	5.38	178	Dark brown, slight sulfur odour
Jan-20	BH2	7.79	6.153	1.637	9.03	1130	24.49	94	4.84	186.5	Cloudy brown, slight sulfur odour
Feb-20	BH2	7.79	6.153	1.637	9.03	1130	24.49	94	4.84	186.5	Cloudy brown, slight sulfur odour
Mar-20	BH2	7.79	6.153	1.637	9.03	1130	24.49	94	4.84	186.5	Cloudy brown, slight sulfur odour
Apr-20	BH2		6.069		9.03		20.2	106.4	4.63	253.2	
May-20	BH2	7.79	5.102	2.688	9.03	1130	18.7	109.9	4.5	272.2	Cloudy brown, slight sulfur odour
Jun-20	BH2	7.79	5.978	1.812	9.03	1130	19.8	102.2	4.68	218.7	Brown, no odour
Jul-20	BH2	7.79	6.035	1.755	9.03		17.6	70	4.63	340	Light brown, no odour
Aug-20	BH2	7.79	5.03	2.76	8.46						Dark brown, no odour
Sep-20	BH2	7.79	5.462	2.328	8.46		20.23	103	4.53	280	Dark brown, no odour
Oct-20	BH2	7.79	5.643	2.147	9.45		20.8	118.6	4.38	274.7	Dark brown, no odour
Nov-20	BH2	7.79	5.328	2.462	9.45		29.5	346	4.91	297.2	Dark brown, sulphur odour
Dec-20	BH2	7.79	5.498	2.292	9.45		21.78	293	4.87	201.9	Light brown, sulphur odour
Jan-21	BH2	7.79	5.36	2.43	9.45		23.5	229	5.69	232.1	Dark brown, sulphur odour
Feb-21	BH2	7.79				1245	22.6	279	5.58	170.7	light brown, sulfur odour
Mar-21	BH2	7.79	5.244			1240	21.4	114	5.62	140	very cloudy brown
Feb-19	BH3	7.57	6.026	1.544	8.94	1440	22.1	82.4	4.54	94	Light Brown - No Odour.
Mar-19	BH3	7.57	6.146	1.544	8.75						No odour - No sample taken.
Apr-19	BH3	7.57	6.059	1.511	9.03						Data logger attached, Silty material at base. No sample taken.
May-19	BH3	7.57	6.064	1.506	9.03						Data logger downloaded.
Jun-19	BH3	7.57	6.005	1.565	9.03						Data logger attached, Silty material at base. No sample taken.
Jul-19	BH3	7.57	5.938	1.632	9.03						Data logger attached, Silty material at base. No sample taken.
Aug-19	BH3	7.57	6.027	1.543	9.03						Data logger attached, Silty material at base. No sample taken.
Sep-19	BH3										Well Decommissioned
Feb-19	BH4	3.06	1.994	1.066	5.92	1420	20.4	129.2	3.85	135	light discolouration - Brown.
Mar-19	BH4	3.06	2.091	0.969	5.92	950	18.92	79	4.52	311	Light Brown - No Odour.
Apr-19	BH4	3.06	1.878	1.182	5.92	1210	21.43	43	4.88	269.9	Cloudy, no odour.
May-19	BH4	3.06	1.847	1.213	5.92	1145	20.14	110	4.65	98.5	Stained brown, no odour.
Jun-19	BH4	3.06	1.723	1.337	5.92	1145	19.01	55	6.41	321.9	Mildly cloudy, no odour.
Jul-19	BH4	3.06	1.617	1.443	5.92	1100	17.6	91.5	4.78	88	Cloudy, no odour.
Aug-19	BH4	3.06	1.736	1.324	5.92	1100	17.96	102	4.76	266	Slightly Cloudy brown
Sep-19	BH4	3.06	1.604	1.456	6.11	1245	20.53	96	4.27	251	Clear, no odour
Oct-19	BH4	3.06	1.531	1.529	6.11	1100	19.18	8	4.93	221	Clear, no odour
Nov-19	BH4	3.06	1.624	1.436	6.11	1010	21.07	95	4.53	290	Cloudy brown, slight sulfur odour
Dec-19	BH4	3.06	2.051	1.009	6.11	1145	20.93	109	6.49	174	Slight cloudy brown, no odour
Jan-20	BH4	3.06	2.252	0.808	6.11	1100	23.3	85	4.63	221	Slight cloudy brown, no odour
Feb-20	BH4	3.06	2.252	0.808	6.11	1100	23.3	85	4.63	221	Slight cloudy brown, no odour
Mar-20	BH4	3.06	2.252	0.808	6.11	1100	23.3	85	4.63	221	Slight cloudy brown, no odour
Apr-20	BH4		1.881		6.11		19	132.1	5.04	206.3	
May-20	BH4	3.06	1.85	1.21	6.11	1100	18.1	174.8	4.78	282.7	Slight cloudy brown, no odour
Jun-20	BH4	3.06	1.494	1.566	6.11	1100	18.5	165.3	4.76	217.2	Slightly brown, no odour
Jul-20	BH4	3.06	1.47	1.59	6.11		16.8	212	4.7	343	Clear, no odour
Aug-20	BH4	3.06	1.009	2.051	6		15.68	152.23	4.58	348.1	Clear, no odour
Sep-20	BH4	3.06	1.31	1.75	6		18.06	151	4.53	348.1	Clear, no odour
Oct-20	BH4	3.06	1.605	1.455	6.45		19.2	166.4	4.25	328.8	Clear, no odour
Nov-20	BH4	3.06	1.052	2.008	6.45		24.4	382	4.64	164.4	Clear, sulphur odour
Dec-20	BH4	3.06	1.406	1.654	6.45		21.23	2226	4.86	419	Clear, sulphur odour
Jan-21	BH4	3.06	1.202	1.858	6.45		23.3	683	5.88	230.5	Clear, no odour
Feb-21	BH4	3.06				1115	22.9	1693	5.96	-124.9	clear, sulfur odour
Mar-21	BH4	3.06	1.098	1.962		1150	20.7	586	5.9	-170	slight brown stain, sulfur odour
Feb-19	BH5	7.36	6.063	1.297	8.63	830	20.1	320	4.06	122	Roots evident, Brown slight sulfur odour.
Mar-19	BH5	7.36	6.146	1.214	8.63						Slight sulfur odour - No sample taken.
Apr-19	BH5	7.36	5.914	1.446	8.71						Slight sulfur odour - No sample taken.
May-19	BH5	7.36	5.894	1.466	8.71						No sample taken, Data logger downloaded.
Jun-19	BH5	7.36	5.823	1.537	8.71						No odour - No sample taken.
Jul-19	BH5	7.36	5.779	1.581	8.71						No odour - No sample taken.
Aug-19	BH5	7.36	5.894	1.466	8.71						No odour - No sample taken.
Sep-19	BH5	7.36	5.786	1.574	8.71						No odour - No sample taken.
Oct-19	BH5	7.36	5.767	1.593	8.8						No odour - No sample taken.
Nov-19	BH5	7.36	5.792	1.568	8.8						No odour - No sample taken.
Dec-19	BH5	7.36	6.143	1.217	8.8						No odour - No sample taken.
Jan-20	BH5	7.36	6.315	1.045	8.8						No odour - No sample taken.
Feb-20	BH5	7.36	6.315	1.045	8.8						No odour - No sample taken.
Mar-20	BH5	7.36	6.315	1.045	8.8						No odour - No sample taken.
Apr-20	BH5		6.061		8.8						No odour - No sample taken.
May-20	BH5	7.36	6.092	1.268	8.8						No sample taken.
Jun-20	BH5	7.36	5.732	1.628	8.8						No sample taken.
Jul-20	BH5	7.36	5.76	1.045	8.8						No sample taken.
Aug-20	BH5										

	Borehole	Top of Casing (mAHD)	Depth to Water (mTOC)	Groundwater Elevation (mAHD)	Well Total Depth at point of sampling (mTOC)	Time	Temp (°C)	EC (us/cm)	pH	Redox (mV)	Comment
Nov-20	BH5	7.36	6.345	1.015	9.28		21.33	356	4.7	-29.8	Clear, sulphur odour
Dec-20	BH5	7.36	5.671	1.689	9.28		ND	ND	ND	ND	No sample taken
Jan-21	BH5	7.36	5.411	1.949	9.28		ND	ND	ND	ND	No sample taken
Feb-21	BH5	7.36									No sample taken
Mar-21	BH5	7.36	5.316	2.044							No sample taken
Feb-19	BH6	3.62	1.823	1.797	4.43	850	23.1	228	4.28	111	Clear to slightly cloudy, sulfur odour.
Mar-19	BH6	3.62	1.913	1.707	4.44	1415	23.17	159	4.74	178	Brown – No Odour.
Apr-19	BH6	3.62	1.761	1.859	4.52	1510	22.03	144	4.52	140.1	Cloudy with slight sulfur odour.
May-19	BH6	3.62	1.766	1.854	4.52	1415	20.62	226	4.7	-5.2	Light brown, no odour.
Jun-19	BH6	3.62	1.713	1.907	4.52	1410	19.73	176	5.45	-104.7	Cloudy, slight sulfur odour
Jul-19	BH6	3.62	1.591	2.029	4.52	1330	17.2	191	4.54	101	Slightly cloudy, no odour
Aug-19	BH6	3.62	1.723	1.897	4.52	1330	18.32	277	4.69	140	Slight brown colour, slight sulfur odour
Sep-19	BH6	3.62	1.647	1.973	4.62	1515	18.66	215	4.61	57	Clear, slight odour
Oct-19	BH6	3.62	1.628	1.992	4.62	1530	21.09	110	5.05	-144	Slight brown colour, slight sulfur odour
Nov-19	BH6	3.62	1.657	1.963	4.62	1230	23.12	335	4.8	6.4	Cloudy brown, slight sulfur odour
Dec-19	BH6	3.62	2.009	1.611	4.62	1345	21.96	256	5.52	-86.2	Mostly clear, slight sulfur odour
Jan-20	BH6	3.62	2.169	1.451	4.62	1320	24.62	190	4.39	92	Brown, no odour
Feb-20	BH6	3.62	2.169	1.451	4.62	1320	24.62	190	4.39	92	Brown, no odour
Mar-20	BH6	3.62	2.169	1.451	4.62	1320	24.62	190	4.39	92	Brown, no odour
Apr-20	BH6		2.033		4.62		20.7	232.2	4.68	138.4	
May-20	BH6	3.62	2.065	1.555	4.62	1320	19.2	305.8	4.5	138.7	Brown, no odour
Jun-20	BH6	3.62	1.798	1.822	4.62	1320	20.1	447.8	4.74	-33.3	Clear, no odour
Jul-20	BH6	3.62	1.728	1.451	4.62		15.7	204	4.68	-52.4	Light brown, no odour
Aug-20	BH6	3.62	1.225	2.395	4.5		15.17	350.62	4.66	-30.4	Clear, sulphur odour
Sep-20	BH6	3.62	1.544	2.076	4.5		20.02	269	4.48	62.5	Clear, sulphur odour
Oct-20	BH6	3.62	1.745	1.875	4.95		19.5	292.4	4.49	17.6	Clear, sulphur odour
Nov-20	BH6	3.62	0.259	3.361	4.95		24.95	226	4.07	5.5	Clear, sulphur odour
Dec-20	BH6	3.62	1.472	2.148	4.95		22.8	1036	4.76	-134	Clear, sulphur odour
Jan-21	BH6	3.62	1.29	2.33	4.95		24.2	859	4.96	-94.8	Clear, sulphur odour
Feb-21	BH6	3.62				1410	2	1160	5.23	-167.9	Ants nest in casing, clear, sulfur odour
Mar-21	BH6	3.62	0.977	2.643			22.9	495	5.23	-172	clear, slight sulfur odour
Feb-19	BH7	2.98	1.938	1.042	4.42	920	23.7	283	4.04	125	Slightly Cloudy, light brown, slight sulfur odour.
Mar-19	BH7	2.98	2.015	0.965	4.42	1330	25	251	4.34	179	Slightly Cloudy, light brown, slight sulfur odour.
Apr-19	BH7	2.98	1.744	1.236	4.51	1530	22.9	233	4.45	94.3	Slightly Cloudy, light brown, slight sulfur odour.
May-19	BH7	2.98	1.744	1.236	4.51	1445	20.62	226	4.7	-5.2	Slightly Cloudy, light brown, slight sulfur odour.
Jun-19	BH7	2.98	1.634	1.346	4.51	1430	19.56	217	5.47	-227.9	Slightly cloudy sulfur odour.
Jul-19	BH7	2.98	1.544	1.436	4.51	1400	17.2	228	4.58	100	Slightly cloudy sulfur odour.
Aug-19	BH7	2.98	1.649	1.331	4.51	1345	17.71	329	4.88	55	Cloudy brown, sulfur odour
Sep-19	BH7	2.98	1.542	1.438	4.61	1415	18.34	232	4.73	-22	Light brown, sulfur odour
Oct-19	BH7	2.98	1.514	1.466	4.61	1350	21.79	183	4.89	-139	Slightly Cloudy, light brown, slight sulfur odour.
Nov-19	BH7	2.98	1.588	1.392	4.61	1210	21.79	391	4.6	13.1	Cloudy brown, slight sulfur odour.
Dec-19	BH7	2.98	1.989	0.991	4.61	1400	21.87	292	5.93	-92.6	Cloudy brown, slight sulfur odour.
Jan-20	BH7	2.98	2.169	0.811	4.61	1410	22.39	164	4.45	23.1	Light brown, slight sulfur odour.
Feb-20	BH7	2.98	2.169	0.811	4.61	1410	22.39	164	4.45	23.1	Light brown, slight sulfur odour.
Apr-20	BH7		1.813		4.61		20.8	190	4.88	-71.2	
May-20	BH7	2.98	1.813	1.167	4.61	1410	19	196.3	4.63	-34.4	Light brown, slight sulfur odour.
Jun-20	BH7	2.98	1.471	1.509	4.61	1410	18.5	170	4.89	-70.3	Light brown, sulphur odour.
Jul-20	BH7	2.98	1.43	1.59	4.61		15.8	155	4.83	-102	Light brown, no odour.
Aug-20	BH7	2.98	1.217	1.763	4.49		15.24	237.95	4.72	-66	Light brown, sulphur odour.
Sep-20	BH7	2.98	1.437	1.543	4.49		21.64	253	4.57	21.9	Light brown, sulphur odour.
Oct-20	BH7	2.98	1.672	1.308	4.95		18.7	284.6	4.27	-29.1	Light brown, sulphur odour.
Nov-20	BH7	2.98	1.225	1.755	4.95		22.8	792	4.42	-104	clear, sulphur odour.
Dec-20	BH7	2.98	1.473	1.507	4.95		24.38	770	4.42	-75.5	Clear, sulphur odour.
Jan-21	BH7	2.98	1.234	1.746	4.95		24.3	810	4.76	-67.2	Light brown, sulphur odour.
Feb-21	BH7	2.98				1435	24.1	892	5.02	-146.3	light brown, sulfur odour
Mar-21	BH7	2.98	1.174	1.806			22.8	350	5.1	-137	clear, sulfur odour
Feb-19	BH8	3.88	2.78	1.1	6.08	1330	21.8	411	4.09	121	Sulfur smell - Dark Brown.
Mar-19	BH8	3.88	2.864	1.016	6.09	1300	21.54	307	4.96	176	Sulfur smell - cloudy
Apr-19	BH8	3.88	2.511	1.369	6.18	1600	20.66	300	4.53	17.6	Sulfur smell - cloudy
May-19	BH8	3.88	2.511	1.369	6.18	1500	20.86	298	4.74	-75	Sulfur smell - cloudy
Jun-19	BH8	3.88	2.346	1.534	6.18	1440	18.78	289	7.43	-340.8	Dark brown cloudy, sulfur odour
Jul-19	BH8	3.88	2.266	1.614	6.18	1430	16.8	347	4.55	101	Cloudy brown, sulfur odour
Aug-19	BH8	3.88	2.406	1.474	6.18	1415	18.2	374	4.66	27	Cloudy brown, sulfur odour
Sep-19	BH8	3.88	2.282	1.598	6.27	1330	18.64	300	4.72	-10	Dark brown cloudy, sulfur odour
Oct-19	BH8	3.88	2.233	1.647	6.28	1415	20.44	224	4.89	-160	Dark brown cloudy, sulfur odour
Nov-19	BH8	3.88	2.312	1.568	6.28	1450	22.5	545	4.51	-28.8	Cloudy brown, sulfur odour
Dec-19	BH8	3.88	2.778	1.102	6.28	1430	22.05	995	6.16	96.8	Cloudy brown, sulfur odour
Jan-20	BH8	3.88	2.969	0.911	6.28	1440	21.99	284	4.08	45.6	Cloudy brown, sulfur odour
Feb-20	BH8	3.88	2.969	0.911	6.28	1440	21.99	284	4.08	45.6	Cloudy brown, sulfur odour
Mar-20	BH8	3.88	2.969	0.911	6.28	1440	21.99	284	4.08	45.6	Cloudy brown, sulfur odour
Apr-20	BH8		2.549		6.28		19.8	218.7	4.65	-70.6	
May-20	BH8	3.88	2.489	1.391	6.28	1440	18.2	242.6	4.49	-42.2	Cloudy brown, sulfur odour
Jun-20	BH8	3.88	2.058	1.822	6.28	1440	17	282.9	4.8	-50.9	Light brown, no odour
Jul-20	BH8	3.88	2.02	1.86	6.28		16	268	4.69	-90	Light brown, no odour
Aug-20	BH8	3.88	1.804	2.076	6.14		15.4	367.95	4.62	-63.2	Light brown, sulphur odour
Sep-20	BH8	3.88	1.156	2.724	6.14		19.41	379	4.46	1.5	Light brown, sulphur odour
Oct-20	BH8	3.88	2.442	1.438	6.28		17.7	314.1	4.3	-57.5	Light brown, sulphur odour
Nov-20	BH8	3.88	1.472	2.408	6.28		22.7	1053	4.64	-116.1	clear, sulphur odour
Dec-20	BH8	3.88	2.198	1.682	6.28		23.5	701	4.71	-124.6	Clear, sulphur odour
Jan-21	BH8	3.88	1.209	2.671	6.28		22.7	846	4.97	-114	Light brown, sulphur odour
Feb-21	BH8	3.88				1500	20.7	1105	5.26	-167.6	
Mar-21	BH8	3.88	1.801	2.079			21.3	366	5.002	-159	slight cloudy brown, sulfur odour
Feb-19	BH9	17.75	Dry	-	15.82						Well was dry.
Mar-19	BH9	17.75	Dry	-	16.01					176	Well was dry.
Apr-19	BH9	17.75	Dry	-	16.01						Well was dry.
May-19	BH9	17.75	Dry	-	16.01						Well was dry.
Jun-19	BH9	17.75	Dry	-	16.01						Well was dry.
Jul-19	BH9	17.75	Dry	-	16.01						Well was dry.
Aug-19	BH9	17.75	Dry	-	16.01						Well was dry.
Sep-19	BH9	17.75	Dry	-	16.01						Well was dry.
Oct-19	BH9	17.75	Dry	-	16.01						Well was dry.
Nov-19	BH9	17.75	Dry	-	16.01						Well was dry.
Dec-19	BH9	17.75	Dry	-	16.01						Well was dry.
Jan-20	BH9	17.75	Dry	-	16.01						Well was dry.
Feb-20	BH9	17.75	Dry	-	16.01						Well was dry.
Mar-20	BH9	17.75	Dry	-	16.01						Well was dry.
Apr-20	BH9	17.75	Dry	-	16.01						Well was dry.
May-20	BH9	17.75	Dry	-	16.01						Well was dry.
Jun-20	BH9	17.75	Dry	-	16.01						Well was dry.
Jul-20	BH9	17.75	Dry	-	16.01						Well was dry.
Aug-20	BH9	17.75	15.723	2.027	16.2		18.43	84.33	4.79	317	Bailer used due to insufficient volume, clear, no odour
Sep-20	BH9	17.75	15.951	1.799	16.2						Insufficient volume to sample
Oct-20	BH9	17.75	Dry	-	18.8						Insufficient well volume for sampling
Sep-20	BH9A	10.25	8.903	1.347	16.16		19.85	266	4.97	317	Newly installed, Silty brown, no odour.
Oct-20	BH9A	10.25	9.163	1.087	16.16		20.2	279.8	4.77	274.7	Newly installed well
Nov-20	BH9A	10.25	8.76	1.49	1						

	Borehole	Top of Casing (mAHD)	Depth to Water (mBTOPC)	Groundwater Elevation (mAHD)	Well Total Depth at point of sampling (mBTOPC)	Time	Temp (°C)	EC (us/cm)	pH	Redox (mV)	Comment
Feb-21	BH9A	10.25				1200	22.5	609	5.46	-141.8	dark brown, sulfur odour
Mar-21	BH9A	10.25	8.713	1.537		1215	20.4	214	5.72	-161	cloudy brown, sulfur odour
Feb-19	BH10	6.69	Dry	-	3.58						Well was dry.
Mar-19	BH10	6.69	Dry	-	3.58					179	Well was dry.
Apr-19	BH10	6.69	Dry	-	3.58						Well was dry.
May-19	BH10	6.69	Dry	-	3.58						Well was dry.
Jun-19	BH10	6.69	Dry	-	3.58						Well was dry.
Jul-19	BH10	6.69	Dry	-	3.58						Well was dry.
Aug-19	BH10	6.69	Dry	-	3.58						Well was dry.
Sep-19	BH10	6.69	Dry	-	3.58						Well was dry.
Oct-19	BH10	6.69	Dry	-	3.58						Well was dry.
Nov-19	BH10	6.69	Dry	-	3.58	1400	22.65	324	4.62	34	Well was dry.
Dec-19	BH10	6.69	Dry	-	3.58						Well was dry.
Jan-20	BH10	6.69	Dry	-	3.58						Well was dry.
Feb-20	BH10	6.69	Dry	-	3.58						Well was dry.
Mar-20	BH10	6.69	Dry	-	3.58						Well was dry.
Apr-20	BH10				3.58						Well was dry.
May-20	BH10	6.69	Dry	-	3.58						Well was dry.
Jun-20	BH10	6.69	Dry	-	3.58						Well was dry.
Jul-20	BH10	6.69	Dry	-	3.58						Well was dry.
Aug-20	BH10	6.69	Dry	-	3.68						Well was dry. Approximately 1.8m of sediment deposited since 2014.
Sep-20	BH10	6.69	Dry	-	3.68						Well was dry. Approximately 1.8m of sediment deposited since 2014
Oct-20	BH10	6.69	Dry	-	5.45						Well was dry.
Nov-20	BH10	6.69	Dry	-	5.45						Well was dry.
Dec-20	BH10	6.69	Dry	-	5.45						Well was dry.
Jan-21	BH10	6.69	Dry	-	5.45						Well was dry.
Feb-21	BH10	6.69	DRY								Well was dry.
Mar-21	BH10	6.69	DRY								Well was dry.
Feb-19	BH11	6.63	3.02	3.61	5.21						Brown - No Odour.
Mar-19	BH11	6.63	3.181	3.02	5.21	745	18.87	168	4.95	10	Light Brown - Slight Odour.
Apr-19	BH11	6.63	3.254	3.376	5.29	1345	21.64	155	4.75	78.3	Cloudy, slight sulfur smell
May-19	BH11	6.63	3.311	3.319	5.29	1245	19.94	232	4.68	-71.5	Data logger downloaded. Light brown, no odour.
Jun-19	BH11	6.63	3.382	3.248	5.29	1250	18.93	185	6.41	-78.5	Cloudy with sulfur odour
Jul-19	BH11	6.63	3.348	3.282	5.29	1215	16.9	296	4.53	101	Cloudy no odour
Aug-19	BH11	6.63	3.503	3.127	5.29	1215	17.66	261	4.74	126	Cloudy light brown, sulfur odour
Sep-19	BH11	6.63	3.546	3.084	5.39	1200	20.26	195	4.64	31.2	Cloudy light brown, sulfur odour
Oct-19	BH11	6.63	3.586	3.044	5.39	1205	19.93	124	4.83	-117	Cloudy light brown, sulfur odour
Nov-19	BH11	6.63	3.621	3.009	5.39						Cloudy light brown, sulfur odour
Dec-19	BH11	6.63	3.859	2.771	5.39	1300	20.55	239	5.42	-60.7	Cloudy brown, sulfur odour
Jan-20	BH11	6.63	3.962	2.668	5.39	1215	22.37	129	4.61	42	Cloudy brown, sulfur odour
Feb-20	BH11	6.63	3.962	2.668	5.39	1215	22.37	129	4.61	42	Cloudy brown, sulfur odour
Mar-20	BH11	6.63	3.962	2.668	5.39	1215	22.37	129	4.61	42	Cloudy brown, sulfur odour
Apr-20	BH11		4.087		5.39		20	140.4	4.84	-39.7	
May-20	BH11	6.63	4.241	2.389	5.39	1215	18.2	147.4	4.69	-65.4	Cloudy brown, sulfur odour
Jun-20	BH11	6.63	4.343	2.87	5.39	1215	18.2	146.2	4.71	-24.7	Brown, dirt odour, well blockage
Jul-20	BH11	6.63	4.484	2.146	5.39		15.8	121	4.6	124	Light Brown, no odour – bore blocked
Aug-20	BH11	6.63	3.621	3.009	5.82		17.28	172.83	4.71	270.4	Light Brown, no odour
Sep-20	BH11	6.63	3.658	2.972	5.82		20.02	220.49	4.52	115.4	Light Brown, no odour
Oct-20	BH11	6.63	3.725	2.905	5.95		19	255.1	4.3	111	Light Brown, no odour
Nov-20	BH11	6.63	3.405	3.225	5.95		23.4	541	4.77	6.6	clear, no odour
Dec-20	BH11	6.63	3.505	3.125	5.95		23.6	459	4.81	-95.6	Clear, sulphur odour
Jan-21	BH11	6.63	3.384	3.246	5.95		22.6	668	5.23	-73.3	Clear, sulphur odour
Feb-21	BH11	6.63				1315	21.1	68	5.3	-107.4	light brown, slight odour
Mar-21	BH11	6.63	3.143	3.487		1325	20.8	291	5.43	-95	Clear, no odour
Feb-19	BH12	8.67	Dry	-	6.17						Well was dry.
Mar-19	BH12	8.67	6.924	1.746	8.03						40mm inner tube installed. No odour – No sample taken
Apr-19	BH12	8.67	6.846	1.824	8.12						40mm inner tube installed. No odour – No sample taken
May-19	BH12	8.67	6.863	1.807	8.12						Acrylic odour. No sample taken.
Jun-19	BH12	8.67	6.832	1.838	8.12						Slight acrylic odour. No sample taken.
Jul-19	BH12	8.67	6.799	1.871	8.12						Slight acrylic odour. No sample taken.
Aug-19	BH12	8.67	6.889	1.781	8.12						Slight acrylic odour. No sample taken.
Sep-19	BH12	8.67	6.827	1.843	8.2						No sample taken.
Oct-19	BH12	8.67	6.881	1.799	8.2						No sample taken.
Nov-19	BH12	8.67	6.89	1.78	8.2						No sample taken.
Dec-19	BH12	8.67	7.076	1.594	8.2						No sample taken.
Jan-20	BH12	8.67	7.252	1.418	8.2						No sample taken.
Feb-20	BH12	8.67	7.252	1.418	8.2						No sample taken.
Mar-20	BH12	8.67	7.252	1.418	8.2						No sample taken.
Apr-20	BH12		7.149		8.2						No sample taken.
May-20	BH12	8.67	7.156	1.514	8.2						No sample taken.
Jun-20	BH12	8.67	7.003	1.667	8.2						No sample taken.
Jul-20	BH12	8.67	7.057	1.613	8.2						No sample taken.
Aug-20	BH12	8.67	6.443	2.227	8.17		17.78	163.09	5.25	-48	Light Brown, no odour
Sep-20	BH12	8.67	6.629	2.041	8.17		21.85	206.44	4.66	134	Light Brown, no odour
Oct-20	BH12	8.67	6.799	1.871	8.39						No sample take, well too skinny
Nov-20	BH12	8.67	6.459	2.211	8.39		24.9	525	5.02	-34.6	Light brown, sulphur odour
Dec-20	BH12	8.67	6.632	2.038	8.39		22.43	532	5	203.3	Clear, no odour
Jan-21	BH12	8.67	6.502	2.168	8.39		21.9	282	5.53	43.7	Clear, no odour
Feb-21	BH12	8.67				1335	21.5	534	5.73	-172.9	Well damaged, clear, sulfur odour
Mar-21	BH12	8.67	6.364	2.306		1345	20.6	211	5.77	-186	Clear, no odour
Feb-19	MW239S	3.04	1.529	1.511	3.89	730	21.7	526	4.09	121	Light Brown - Slight Sulfur odour.
Mar-19	MW239S	3.04	1.615	1.425	3.89	1445	23.1	323	4.43		Dark Brown - Slight Sulfur odour.
Apr-19	MW239S	3.04	1.421	1.619	3.89	1445	21.43	352	4.72	45.3	Light Brown - Slight Sulfur odour
May-19	MW239S	3.04	1.412	1.628	3.89	1345	19.99	392	4.64	-65.8	Data logger downloaded. Dark brown, sulfur odour.
Jun-19	MW239S	3.04	1.344	1.696	3.89	1350	19.3	305	5.7	-117.9	Cloudy, sulfur odour.
Jul-19	MW239S	3.04	1.262	1.778	3.89	1315	15.8	37	4.67	94	Cloudy, sulfur odour.
Aug-19	MW239S	3.04	1.352	1.688	3.89	1300	17.99	530	4.75	72.8	Dark Brown - Slight Sulfur odour.
Sep-19	MW239S	3.04	1.269	1.771	3.89	1430	17.56	397	4.61	-11	Cloudy Brown, Sulfur odour.
Oct-19	MW239S	3.04	1.248	1.792	4.06	1300	20.87	331	4.81	-132	Cloudy Brown, Sulfur odour.
Nov-19	MW239S	3.04	1.256	1.784	4.06	1300	21.18	718	4.58	-17.6	Cloudy brown, sulfur odour
Dec-19	MW239S	3.04	1.648	1.392	4.06	1315	20.33	523	5.64	-104.7	Cloudy brown, sulfur odour
Jan-20	MW239S	3.04	1.823	1.217	4.06	1250	24.71	396	4.59	16.1	Dark brown, sulfur odour
Feb-20	MW239S	3.04	1.823	1.217	4.06	1250	24.71	396	4.59	16.1	Dark brown, sulfur odour
Mar-20	MW239S	3.04	1.823	1.217	4.06	1250	24.71	396	4.59	16.1	Dark brown, sulfur odour
Apr-20	MW239S		1.576		4.06		20.3	293.7	4.74	-77.4	
May-20	MW239S	3.04	1.578	1.462	4.06	1250	18.4	409	4.32	-53.9	Dark brown, sulfur odour
Jun-20	MW239S	3.04	1.326	1.714	4.06	1250	15.4	474.9	4.73	-52.9	Dark brown, sulfur odour
Jul-20	MW239S	3.04	1.3	1.74	4.06		15.3	0.27	12.7	144	Brown, no odour
Aug-20	MW239S	3.04	0.981	2.059	3.9		15.74	431.08	4.72	2.3	Light Brown, sulphur odour
Sep-20	MW239S	3.04	1.116	1.924	3.9		18.87	337.89	4.42	79.8	Light Brown, sulphur odour
Oct-20	MW239S	3.04	1.364	1.676	4		19.6	522	4.27	28.7	Light Brown, sulphur odour
Nov-20	MW239S	3.04	0.998	2.042	4		22.4	1443	4.55	-83.8	Light Brown, sulphur odour
Dec-20	MW239S	3.04	1.2	1.84	4		23	1389	4.6	-126.1	Dark brown, sulphur odour
Jan-21	MW239S	3.04	0.998	2.042	4		23.6	1221	5.08	-127.7	Dark brown, sulphur odour
Feb-21	MWS	3.04				1350	22.8	1676	5.12	-155.7	dark brown, sulfur odour
Mar-21	MW239S	3.04	0.923	2.117			22.3	402	5.19	-158	slight cloudy brown, sulfur odour
Feb-19	MW239D	3.04	1.312	1.728	20.21						-
Mar-19	MW239D	3.04	1.591	1.449	20.19						No odour – No sample taken
Apr-19	MW239D	3.04	1.392	1.648	20.2						No odour – No sample taken

	Borehole	Top of Casing (mAHD)	Depth to Water (mTOC)	Groundwater Elevation (mAHD)	Well Total Depth at point of sampling (mTOC)	Time	Temp (°C)	EC (us/cm)	pH	Redox (mV)	Comment
May-19	MW239D	3.04	1.383	1.657	20.2						No odour – No sample taken
Jun-19	MW239D	3.04	1.32	1.72	20.2						No odour – No sample taken
Jul-19	MW239D	3.04	1.239	1.801	20.2						No odour – No sample taken
Aug-19	MW239D	3.04	1.327	1.713	20.2						Slight Sulfur odour, no sample taken
Sep-19	MW239D	3.04	1.248	1.792	20.2						Slight Sulfur odour, no sample taken
Oct-19	MW239D	3.04	1.226	1.814	20.32						Slight Sulfur odour, no sample taken
Nov-19	MW239D	3.04	1.238	1.802	20.32						Slight Sulfur odour, no sample taken
Dec-19	MW239D	3.04	1.626	1.414	20.32						Slight Sulfur odour, no sample taken
Jan-20	MW239D	3.04	1.799	1.241	20.32						Slight Sulfur odour, no sample taken
Feb-20	MW239D	3.04	1.799	1.241	20.32						Slight Sulfur odour, no sample taken
Mar-20	MW239D	3.04	1.799	1.241	20.32						Slight Sulfur odour, no sample taken
Apr-20	MW239D				20.32						
Jun-20	MW239D	3.04	1.328	1.712	20.32						No sample taken
Jul-20	MW239D	3.04	1.32	1.72	20.32						No sample taken
Aug-20	MW239D	3.04	0.955	2.085	20.49						No sample taken
Sep-20	MW239D	3.04	1.183	1.857	20.49						No sample taken
Oct-20	MW239D	3.04	1.331	1.709	20.49						No sample taken
Nov-20	MW239D	3.04	1.132	1.908	20.49						No sample taken
Dec-20	MW239D	3.04	1.172	1.868	20.49						No sample taken
Jan-21	MW239D	3.04	0.975	2.065	20.49						No sample taken
Feb-21	MWB	3.04									
Mar-21	MW239D	3.04	0.901	2.139							No sample
Feb-19	SW1*	2.5	Dry	-	N/A						Location was dry.
Mar-19	SW1*	2.5	Dry	-	N/A						Location was dry.
Apr-19	SW1*	2.5	2.49	0.01	N/A	1200	23.16	1003	3.95	405.9	Small pool of surface water with stained brown water.
May-19	SW1*	2.5	0.01	2.51	N/A	1115	14.9	966	4.42	106.7	Small pool of surface water with stained brown water.
Jun-19	SW1*	N/A	0.14	2.51	N/A	1140	14.5	811	6.4	298.4	Small pool of surface water with stained brown water.
Jul-19	SW1*	N/A	0.2	2.7	N/A	1105	9.7	827	4.56	99	Dark brown, no odour, slight sheen
Aug-19	SW1*	N/A	0.15	2.65	N/A	1045	9.52	1205	4.6	263	Natural tannin stained brown, sulfur odour
Sep-19	SW1*	N/A	0.26	2.76	N/A	1300	16.59	1138	4.21	323	Natural tannin stained brown, sulfur odour
Oct-19	SW1*	N/A	0.29	2.79	N/A	1045	16.56	857	4.35	339	Natural tannin stained brown, sulfur odour
Nov-19	SW1*	N/A	0.02	2.52	N/A	1145	23.75	1964	4.53	230	Significant reduction in water level, tannins stained brown, sulfur odour
Dec-19	SW1*	N/A	Dry	N/A							Location was dry
Jan-20	SW1*	N/A	Dry	N/A							Location was dry
Feb-20	SW1*	N/A	Dry	N/A							Location was dry
Mar-20	SW1*	N/A	Dry	N/A							Location was dry
Apr-20	SW1*	N/A	1.9	N/A		18.3	144.6	8.23			
May-20	SW1*	N/A	3	N/A		1310	14	169.4	7.4	183.1	
Jun-20	SW1*	N/A	0.52	-	N/A	1310	11.9	120.5	6.9	139.8	Light brown, no odour
Jul-20	SW1*	N/A	0.54	-	N/A		12	98	7.4	226	Light brown, no odour
Aug-20	SW1*	N/A	>0.6	-	N/A		14.21	83.65	6.38	229.4	Light brown, no odour
Sep-20	SW1*	N/A	0.6	-	N/A		16.51	116	6.36	229.4	Light brown, no odour
Oct-20	SW1*	N/A	0.6	N/A		18.2	313.3	6.68	131		Light brown, no odour
Nov-20	SW1*	N/A	0.6	N/A		22.9	461	6.91	1140		Clear, no odour
Dec-20	SW1*	N/A	0.6	N/A		26.4	658	6.61	49.8		Clear, no odour
Jan-21	SW1*	N/A	0.6	N/A		25.1	594	6.77	67.2		Clear, no odour
Feb-21	SW1	N/A				1100	22.58	608	6.68	65.1	Clear, no odour, very full
Mar-21	SW1	N/A	> 0.6			1130	21.1	184	6.59	118	Slight brown/tan, no odour
Feb-19	SW2*	3.3	Dry	-	N/A						Location was dry.
Mar-19	SW2*	3.3	Dry	-	N/A						Location was dry.
Apr-19	SW2*	3.3	Dry	-	N/A						Location was dry.
May-19	SW2*	3.3	Dry	-	N/A						Location was dry.
Jun-19	SW2*	N/A	Dry	-	N/A						Location was dry.
Jul-19	SW2*	N/A	Dry	-	N/A						Location was dry.
Aug-19	SW2*	N/A	Dry	-	N/A						Location was dry.
Sep-19	SW2*	N/A	Dry	N/A							Location was dry.
Oct-19	SW2*	N/A	Dry	N/A							Location was dry.
Nov-19	SW2*	N/A	Dry	N/A							Location was dry.
Dec-19	SW2*	N/A	Dry	N/A							Location was dry.
Jan-20	SW2*	N/A	Dry	N/A							Location was dry.
Feb-20	SW2*	N/A	Dry	N/A							Location was dry.
Mar-20	SW2*	N/A	Dry	N/A							Location was dry.
Apr-20	SW2*	N/A	Dry	N/A							Location was dry.
May-20	SW2*	N/A	Dry	N/A							Location was dry.
Jun-20	SW2*	N/A	Dry	-	N/A						Location was dry.
Jul-20	SW2*	N/A	Dry	-	N/A						Location was dry – ground damp
Aug-20	SW2*	N/A	Dry	-	N/A						Location was dry – ground damp
Sep-20	SW2*	N/A	Dry	-	N/A						Location was dry
Oct-20	SW2*	N/A	Dry	N/A	N/A						Location was dry
Nov-20	SW2*	N/A	Dry	N/A	N/A						Location was dry
Dec-20	SW2*	N/A	Dry	N/A	N/A						Location was dry
Jan-21	SW2*	N/A	Dry	N/A	N/A						Location was dry
Feb-21	SW2	N/A	0.1			1100	20.3	132	6.16	244	Slight brown/tan, sulfur odour
Mar-21	SW3*	2.1	1.1	1	N/A	1615	26	313	5.11	62	Water was at a low level and was not seen to be flowing.
Mar-19	SW3*	2.1	1.1	1	N/A	1515	25.87	342	6.08		Water was at a low level and was not seen to be flowing.
Apr-19	SW3*	2.1	1.1	0.1	N/A	1430	19.88	311	6.02	-12.8	Water clear, no odour.
May-19	SW3*	2.1	0.1	1.1	N/A	1315	14.54	344	5.54	71.6	Water clear, no odour.
Jun-19	SW3*	N/A	0.15	1.1	N/A	1330	16.36	290	6.41	52.4	Water clear, no odour.
Jul-19	SW3*	N/A	0.215	1.215	N/A	1245	14.6	431	4.27	116	Water clear, no odour.
Aug-19	SW3*	N/A	0.195	1.195	N/A	1245	11.96	464	4.67	152	Water clear, no odour.
Sep-19	SW3*	N/A	0.24	1.24	N/A	1445	17.05	449	5.02	86.7	Water clear, no odour.
Oct-19	SW3*	N/A	0.29	1.29	N/A	1230	18.77	313	4.36	315	Water clear, no odour.
Nov-19	SW3*	N/A	0.02	1.02	N/A	945	19.54	470	5.04	97.7	Mostly clear (red algae present), no odour
Dec-19	SW3*	N/A	Dry	N/A		1000	20	440	5.69	29.3	Small amount of standing water
Jan-20	SW3*	N/A	Dry	N/A							Location was dry.
Feb-20	SW3*	N/A	Dry	N/A							Location was dry.
Mar-20	SW3*	N/A	Dry	N/A							Location was dry.
Apr-20	SW3*	N/A	0.76	N/A		17.5	276.9	4.24			
May-20	SW3*	N/A	0.85	N/A		1330	14.3	286.6	4.72	304.7	
Jun-20	SW3*	N/A	0.24	-	N/A	1330	14.5	468.6	4.18	220.9	
Jul-20	SW3*	N/A	0.3	-	N/A	14	395	4	381		Clear, no odour
Aug-20	SW3*	N/A	0.56	-	N/A	13.56	477.36	3.77	4.08		Clear, no odour
Sep-20	SW3*	N/A	0.39	-	N/A	16.99	399	3.79	4.08		Clear, no odour
Oct-20	SW3*	N/A	0.39	N/A		18.3	375.4	3.74	318		Clear, no odour
Nov-20	SW3*	N/A	0.39	N/A		20.1	1218	4.78			Clear, slight odour
Dec-20	SW3*	N/A	0.31	N/A		23.6	1097	5.45	171.1		Clear, no odour
Jan-21	SW3*	N/A	0.31	N/A		22.1	1056	5.31	147.2		Clear, no odour
Feb-21	SW3	N/A				1015	21.2	1101	5.95	36.9	Clear, no odour
Mar-21	SW3	N/A	> 0.6			1030	20.6	291	6.54	1076	Slight brown/tan, sulfur odour
Feb-19	SW4*	2	Dry	-	N/A						Location was dry.
Mar-19	SW4*	2	Dry	-	N/A						Location was dry.
Apr-19	SW4*	2	1.9	1.9	N/A	1115	17.57	339	3.69	430.5	Water clear, no odour.
May-19	SW4*	2	0.135	2.135	N/A	1030	12.03	389	3.69	211.4	Water clear, no odour.
Jun-19	SW4*	N/A	0.175	2.135	N/A	1045	13.34	313	6.44	377.3	Water clear, no odour.
Jul-19	SW4*	N/A	0.281	2.281	N/A	930	9.9	371	4.23	116	Light brown, no odour.
Aug-19	SW4*	N/A	0.18	2.18	N/A	950	8.07	485	4.17	294	Clear, no odour.
Sep-19	SW4*	N/A	0.29	2.29	N/A	1030	14.8	371	4.19	360	Clear, no odour.
Oct-19	SW4*	N/A	0.35	2.35	N/A	945	16.45	325	4.36	370	Clear, no odour.

	Borehole	Top of Casing (mAHD)	Depth to Water (mBTOC)	Groundwater Elevation (mAHD)	Well Total Depth at point of sampling (mBTOC)	Time	Temp (°C)	EC (us/cm)	pH	Redox (mV)	Comment
Nov-19	SW4*	N/A	0.15	2.15	N/A	1045	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	1400	12.1	337.5	4.69	230.1	
Jun-20	SW4*	N/A	0.38	-	N/A	1400	12.5	375	4.82	236.2	Clear, No odour
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				945	20.6	1468	6.98	-140.4	Natural sheen, no odour, very full
Mar-21	SW4	N/A	> 0.6			1000	19.5	529	7.34	-15.2	Brown/Tan, sulfur odour



## ATTACHMENT 3: LAB RESULTS





Client:		Site, COC and Contact Data			Laboratory:	
Kleinfelder Australia Pty Ltd 95 Mitchell Road Cardiff, NSW 2285 Phone: 02 4949 5200		Site Name: WSS - Cabbage Tree Rd water monitoring	Sampler Name: Dan Kousbroek	ALS	Contact Number: 045 8197 576	5/55B Maitland Rd Mayfield West, Newcastle NSW 2304 Phone: (02) 4014 2500
Required TAT:		24 hrs	48 hrs	3 days	5 days	7 days
Data QA level:		LAB minimum unless specified:			PM e-mail: toverton@kleinfelder.com	Send Results to: dkousbroek@kleinfelder.com & toverton@kleinfelder.com

## CHAIN OF CUSTODY

Relinquished by (print):  
*Daniel Kousbroek*  
(sign)

Received by (print):  
*M.W.*  
(sign)

Relinquished:  
*[Signature]*  
(sign)

Received by:  
*W.A.M.*  
(sign)

Relinquished:  
*[Signature]*  
(sign)

Received by:  
*P.P.*  
(sign)

Relinquished:  
*[Signature]*  
(sign)

Received by:  
*[Signature]*  
(sign)

Relinquished:  
*[Signature]*  
(sign)

Received by:  
*[Signature]*  
(sign)

Relinquished:  
*[Signature]*  
(sign)

Received by:  
*[Signature]*  
(sign)

Notes:

Date / Time:

Temp (°C)

Notes:

## CERTIFICATE OF ANALYSIS

Work Order	<b>ES2109522</b>	Page	: 1 of 20
Client	<b>KLEINFELDER AUSTRALIA PTY LTD</b>	Laboratory	: Environmental Division Sydney
Contact	<b>DANIEL KOUSBROEK</b>	Contact	: Shirley LeCornu
Address	: 95 Mitchell Rd Cardiff 2285	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +6138549 9630
Project	: 20193820	Date Samples Received	: 17-Mar-2021 16:05
Order number	: ----	Date Analysis Commenced	: 19-Mar-2021
C-O-C number	: ----	Issue Date	: 25-Mar-2021 11:25
Sampler	: Dan Kousbroek		
Site	: WSS-Cabbage Tree Rd Water monitoring		
Quote number	: ME/114/19 ALS Compass		
No. of samples received	: 16		
No. of samples analysed	: 16		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

### Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW



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

## 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

∅ = 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.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EA016: Calculated TDS is determined from Electrical conductivity using a conversion factor of 0.65.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID		BH1	BH2	BH4	BH6	BH7	
Compound	CAS Number	LOR	Unit	Sampling date / time	17-Mar-2021 00:00				
					Result	Result	Result	Result	Result
<b>EA005P: pH by PC Titrator</b>									
pH Value	---	0.01	pH Unit		6.02	5.28	5.07	5.07	4.90
<b>EA010P: Conductivity by PC Titrator</b>									
Electrical Conductivity @ 25°C	---	1	µS/cm		111	88	501	358	279
<b>EA016: Calculated TDS (from Electrical Conductivity)</b>									
Total Dissolved Solids (Calc.)	---	1	mg/L		72	57	326	233	181
<b>EA065: Total Hardness as CaCO<sub>3</sub></b>									
Total Hardness as CaCO <sub>3</sub>	---	1	mg/L		11	13	50	47	29
<b>ED037P: Alkalinity by PC Titrator</b>									
Hydroxide Alkalinity as CaCO <sub>3</sub>	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO <sub>3</sub>	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO <sub>3</sub>	71-52-3	1	mg/L		11	1	3	2	<1
Total Alkalinity as CaCO <sub>3</sub>	---	1	mg/L		11	1	3	2	<1
<b>ED041G: Sulfate (Turbidimetric) as SO<sub>4</sub> 2- by DA</b>									
Sulfate as SO <sub>4</sub> - Turbidimetric	14808-79-8	1	mg/L		4	7	26	25	11
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L		23	13	128	80	68
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L		1	2	2	4	<1
Magnesium	7439-95-4	1	mg/L		2	2	11	9	7
Sodium	7440-23-5	1	mg/L		14	10	77	51	36
Potassium	7440-09-7	1	mg/L		<1	<1	1	1	2
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Barium	7440-39-3	0.001	mg/L		0.004	0.005	0.027	0.068	0.009
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	0.003
Chromium	7440-47-3	0.001	mg/L		0.002	0.001	<0.001	<0.001	0.002
Copper	7440-50-8	0.001	mg/L		<0.001	0.003	0.006	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		0.027	0.016	0.029	0.012	0.028
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	0.002	<0.001	0.005
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID	BH1	BH2	BH4	BH6	BH7	
Compound	CAS Number	LOR	Sampling date / time	17-Mar-2021 00:00				
			Unit	ES2109522-001	ES2109522-002	ES2109522-003	ES2109522-004	ES2109522-005
<b>EG020F: Dissolved Metals by ICP-MS - Continued</b>								
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	0.596	0.006	0.019	0.006	<0.005
Iron	7439-89-6	0.05	mg/L	4.00	<0.05	1.39	1.39	2.28
<b>EG035F: Dissolved Mercury by FIMS</b>								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
<b>EK040P: Fluoride by PC Titrator</b>								
Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
<b>EN055: Ionic Balance</b>								
ø Total Anions	---	0.01	meq/L	0.95	0.53	4.21	2.82	2.15
ø Total Cations	---	0.01	meq/L	0.82	0.70	4.38	3.18	2.19
ø Ionic Balance	---	0.01	%	----	----	1.96	----	----
<b>EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup</b>								
C10 - C14 Fraction	---	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	---	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	---	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	---	50	µg/L	<50	<50	<50	<50	<50
<b>EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup</b>								
>C10 - C16 Fraction	---	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	---	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	---	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	---	100	µg/L	<100	<100	<100	<100	<100
>C10 - C16 Fraction minus Naphthalene (F2)	---	100	µg/L	<100	<100	<100	<100	<100
<b>EP080/071: Total Petroleum Hydrocarbons</b>								
C6 - C9 Fraction	---	20	µg/L	<20	<20	<20	<20	<20
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
<b>EP080: BTEXN</b>								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2

## *Analytical Results*

## *Analytical Results*

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	BH1	BH2	BH4	BH6	BH7
			Sampling date / time	17-Mar-2021 00:00				
Compound	CAS Number	LOR	Unit	ES2109522-001	ES2109522-002	ES2109522-003	ES2109522-004	ES2109522-005
<b>EP231S: PFAS Surrogate - Continued</b>								
13C4-PFOS	---	0.02	%	84.0	85.1	81.8	85.9	87.1
13C8-PFOA	---	0.02	%	92.4	91.4	89.9	91.5	91.0

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID		BH8	BH9A	BH11	BH12	SW1	
Compound	CAS Number	LOR	Unit	Sampling date / time	17-Mar-2021 00:00				
					Result	Result	Result	Result	Result
<b>EA005P: pH by PC Titrator</b>									
pH Value	---	0.01	pH Unit	4.57	5.23	4.66	---	6.63	
<b>EA010P: Conductivity by PC Titrator</b>									
Electrical Conductivity @ 25°C	---	1	µS/cm	329	164	223	---	139	
<b>EA016: Calculated TDS (from Electrical Conductivity)</b>									
Total Dissolved Solids (Calc.)	---	1	mg/L	214	107	145	---	90	
<b>EA065: Total Hardness as CaCO<sub>3</sub></b>									
Total Hardness as CaCO <sub>3</sub>	---	1	mg/L	25	15	25	---	46	
<b>ED037P: Alkalinity by PC Titrator</b>									
Hydroxide Alkalinity as CaCO <sub>3</sub>	DMO-210-001	1	mg/L	<1	<1	<1	---	<1	
Carbonate Alkalinity as CaCO <sub>3</sub>	3812-32-6	1	mg/L	<1	<1	<1	---	<1	
Bicarbonate Alkalinity as CaCO <sub>3</sub>	71-52-3	1	mg/L	<1	4	<1	---	45	
Total Alkalinity as CaCO <sub>3</sub>	---	1	mg/L	<1	4	<1	---	45	
<b>ED041G: Sulfate (Turbidimetric) as SO<sub>4</sub> 2- by DA</b>									
Sulfate as SO <sub>4</sub> - Turbidimetric	14808-79-8	1	mg/L	19	12	17	---	<1	
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L	75	35	48	---	13	
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L	<1	1	<1	---	15	
Magnesium	7439-95-4	1	mg/L	6	3	6	---	2	
Sodium	7440-23-5	1	mg/L	50	25	29	---	10	
Potassium	7440-09-7	1	mg/L	<1	<1	<1	---	2	
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	---	<0.001	
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	---	<0.05	
Barium	7440-39-3	0.001	mg/L	0.012	0.006	0.010	---	0.013	
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	---	<0.001	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	---	<0.0001	
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	---	<0.001	
Chromium	7440-47-3	0.001	mg/L	0.001	<0.001	0.001	---	<0.001	
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	---	<0.001	
Manganese	7439-96-5	0.001	mg/L	0.010	0.024	0.002	---	0.036	
Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.003	---	<0.001	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	---	<0.001	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	---	<0.01	

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID	BH8	BH9A	BH11	BH12	SW1	
Compound	CAS Number	LOR	Sampling date / time	17-Mar-2021 00:00				
			Unit	ES2109522-006	ES2109522-007	ES2109522-008	ES2109522-009	ES2109522-010
<b>EG020F: Dissolved Metals by ICP-MS - Continued</b>								
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	---	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	0.010	0.014	---	0.040
Iron	7439-89-6	0.05	mg/L	3.86	0.27	0.20	---	0.16
<b>EG035F: Dissolved Mercury by FIMS</b>								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	---	<0.0001
<b>EK040P: Fluoride by PC Titrator</b>								
Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	<0.1	---	0.1
<b>EN055: Ionic Balance</b>								
ø Total Anions	---	0.01	meq/L	2.51	1.32	1.71	---	1.26
ø Total Cations	---	0.01	meq/L	2.67	1.38	1.76	---	1.40
<b>EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup</b>								
C10 - C14 Fraction	---	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	---	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	---	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	---	50	µg/L	<50	<50	<50	<50	<50
<b>EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup</b>								
>C10 - C16 Fraction	---	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	---	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	---	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	---	100	µg/L	<100	<100	<100	<100	<100
>C10 - C16 Fraction minus Naphthalene (F2)	---	100	µg/L	<100	<100	<100	<100	<100
<b>EP080/071: Total Petroleum Hydrocarbons</b>								
C6 - C9 Fraction	---	20	µg/L	<20	<20	<20	<20	<20
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
<b>EP080: BTEXN</b>								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID	BH8	BH9A	BH11	BH12	SW1	
Compound	CAS Number	LOR	Sampling date / time	17-Mar-2021 00:00				
			Unit	ES2109522-006	ES2109522-007	ES2109522-008	ES2109522-009	ES2109522-010
<b>EP080: BTEXN - Continued</b>								
<sup>^</sup> Total Xylenes	---	2	µg/L	<2	<2	<2	<2	<2
<sup>^</sup> Sum of BTEX	---	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
<b>EP231A: Perfluoroalkyl Sulfonic Acids</b>								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	---	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	---	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	---	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	---	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	---	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	---	<0.02
<b>EP231B: Perfluoroalkyl Carboxylic Acids</b>								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	---	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	---	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	---	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	---	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	---	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	---	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	---	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	---	<0.02
Perfluorododecanoic acid (PFDODA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	---	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	---	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	---	<0.05
<b>EP231C: Perfluoroalkyl Sulfonamides</b>								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	---	<0.02

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID	BH8	BH9A	BH11	BH12	SW1	
Compound	CAS Number	LOR	Sampling date / time	17-Mar-2021 00:00				
			Unit	ES2109522-006	ES2109522-007	ES2109522-008	ES2109522-009	ES2109522-010
<b>EP231C: Perfluoroalkyl Sulfonamides - Continued</b>								
N-Methyl perfluoroctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	----	<0.05
N-Ethyl perfluoroctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	----	<0.05
N-Methyl perfluoroctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	----	<0.05
N-Ethyl perfluoroctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	----	<0.05
N-Methyl perfluoroctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	----	<0.02
N-Ethyl perfluoroctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	----	<0.02
<b>EP231D: (n:2) Fluorotelomer Sulfonic Acids</b>								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	----	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	----	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	----	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	----	<0.05
<b>EP231P: PFAS Sums</b>								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	----	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	----	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	----	<0.01
<b>EP080S: TPH(V)/BTEX Surrogates</b>								
1,2-Dichloroethane-D4	17060-07-0	2	%	116	115	117	114	117
Toluene-D8	2037-26-5	2	%	112	106	116	110	114
4-Bromofluorobenzene	460-00-4	2	%	110	106	112	108	111
<b>EP231S: PFAS Surrogate</b>								
13C4-PFOS	----	0.02	%	92.0	83.1	96.3	----	85.1
13C8-PFOA	----	0.02	%	92.9	91.7	92.5	----	92.9

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID		SW3	SW4	MW239S	QW40	QW41	
Compound	CAS Number	LOR	Unit	Sampling date / time	17-Mar-2021 00:00				
					Result	Result	Result	Result	Result
<b>EA005P: pH by PC Titrator</b>									
pH Value	---	0.01	pH Unit		4.65	6.23	4.73	---	---
<b>EA010P: Conductivity by PC Titrator</b>									
Electrical Conductivity @ 25°C	---	1	µS/cm		237	271	343	---	---
<b>EA016: Calculated TDS (from Electrical Conductivity)</b>									
Total Dissolved Solids (Calc.)	---	1	mg/L		154	176	223	---	---
<b>EA065: Total Hardness as CaCO<sub>3</sub></b>									
Total Hardness as CaCO <sub>3</sub>	---	1	mg/L		8	41	29	---	---
<b>ED037P: Alkalinity by PC Titrator</b>									
Hydroxide Alkalinity as CaCO <sub>3</sub>	DMO-210-001	1	mg/L		<1	<1	<1	---	---
Carbonate Alkalinity as CaCO <sub>3</sub>	3812-32-6	1	mg/L		<1	<1	<1	---	---
Bicarbonate Alkalinity as CaCO <sub>3</sub>	71-52-3	1	mg/L		<1	26	<1	---	---
Total Alkalinity as CaCO <sub>3</sub>	---	1	mg/L		<1	26	<1	---	---
<b>ED041G: Sulfate (Turbidimetric) as SO<sub>4</sub> 2- by DA</b>									
Sulfate as SO <sub>4</sub> - Turbidimetric	14808-79-8	1	mg/L		15	10	38	---	---
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L		51	54	70	---	---
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L		<1	10	<1	---	---
Magnesium	7439-95-4	1	mg/L		2	4	7	---	---
Sodium	7440-23-5	1	mg/L		29	36	49	---	---
Potassium	7440-09-7	1	mg/L		<1	2	1	---	---
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Arsenic	7440-38-2	0.001	mg/L		<b>0.004</b>	<b>0.002</b>	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Barium	7440-39-3	0.001	mg/L		<b>0.013</b>	<b>0.020</b>	<b>0.011</b>	<0.001	<0.001
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L		<b>0.002</b>	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L		<b>0.001</b>	<b>0.002</b>	<b>0.002</b>	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		<b>0.016</b>	<b>0.057</b>	<b>0.010</b>	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		<b>0.003</b>	<0.001	<b>0.004</b>	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID	SW3	SW4	MW239S	QW40	QW41	
Compound	CAS Number	LOR	Sampling date / time	17-Mar-2021 00:00				
			Unit	ES2109522-011	ES2109522-012	ES2109522-013	ES2109522-014	ES2109522-015
<b>EG020F: Dissolved Metals by ICP-MS - Continued</b>								
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	0.007	<0.005	0.009	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	12.4	15.6	0.95	<0.05	<0.05
<b>EG035F: Dissolved Mercury by FIMS</b>								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
<b>EK040P: Fluoride by PC Titrator</b>								
Fluoride	16984-48-8	0.1	mg/L	<0.1	0.4	<0.1	---	---
<b>EN055: Ionic Balance</b>								
ø Total Anions	---	0.01	meq/L	1.75	2.25	2.76	---	---
ø Total Cations	---	0.01	meq/L	1.43	2.44	2.73	---	---
<b>EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup</b>								
C10 - C14 Fraction	---	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	---	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	---	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	---	50	µg/L	<50	<50	<50	<50	<50
<b>EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup</b>								
>C10 - C16 Fraction	---	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	---	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	---	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	---	100	µg/L	<100	<100	<100	<100	<100
>C10 - C16 Fraction minus Naphthalene (F2)	---	100	µg/L	<100	<100	<100	<100	<100
<b>EP080/071: Total Petroleum Hydrocarbons</b>								
C6 - C9 Fraction	---	20	µg/L	<20	<20	<20	<20	<20
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
<b>EP080: BTEXN</b>								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID	SW3	SW4	MW239S	QW40	QW41	
Compound	CAS Number	LOR	Sampling date / time	17-Mar-2021 00:00				
			Unit	ES2109522-011	ES2109522-012	ES2109522-013	ES2109522-014	ES2109522-015
<b>EP080: BTEXN - Continued</b>								
<sup>^</sup> Total Xylenes	---	2	µg/L	<2	<2	<2	<2	<2
<sup>^</sup> Sum of BTEX	---	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
<b>EP231A: Perfluoroalkyl Sulfonic Acids</b>								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.02	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
<b>EP231B: Perfluoroalkyl Carboxylic Acids</b>								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
<b>EP231C: Perfluoroalkyl Sulfonamides</b>								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID	SW3	SW4	MW239S	QW40	QW41	
Compound	CAS Number	LOR	Sampling date / time	17-Mar-2021 00:00				
			Unit	ES2109522-011	ES2109522-012	ES2109522-013	ES2109522-014	ES2109522-015
<b>EP231C: Perfluoroalkyl Sulfonamides - Continued</b>								
N-Methyl perfluoroctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluoroctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluoroctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluoroctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluoroctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluoroctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
<b>EP231D: (n:2) Fluorotelomer Sulfonic Acids</b>								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
<b>EP231P: PFAS Sums</b>								
Sum of PFAS	----	0.01	µg/L	<0.01	0.04	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	0.04	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	0.04	<0.01	<0.01	<0.01
<b>EP080S: TPH(V)/BTEX Surrogates</b>								
1,2-Dichloroethane-D4	17060-07-0	2	%	119	116	118	116	112
Toluene-D8	2037-26-5	2	%	113	113	114	110	111
4-Bromofluorobenzene	460-00-4	2	%	113	111	111	107	110
<b>EP231S: PFAS Surrogate</b>								
13C4-PFOS	----	0.02	%	81.5	94.2	80.3	87.2	85.7
13C8-PFOA	----	0.02	%	91.4	93.5	91.4	92.2	97.6

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID		SW2	---	---	---	---	---
Compound	CAS Number	LOR	Unit	Sampling date / time	17-Mar-2021 00:00	---	---	---	---
				ES2109522-016	-----	-----	-----	-----	-----
<b>EA005P: pH by PC Titrator</b>									
pH Value	---	0.01	pH Unit	5.08	---	---	---	---	---
<b>EA010P: Conductivity by PC Titrator</b>									
Electrical Conductivity @ 25°C	---	1	µS/cm	83	---	---	---	---	---
<b>EA016: Calculated TDS (from Electrical Conductivity)</b>									
Total Dissolved Solids (Calc.)	---	1	mg/L	54	---	---	---	---	---
<b>EA065: Total Hardness as CaCO<sub>3</sub></b>									
Total Hardness as CaCO <sub>3</sub>	---	1	mg/L	13	---	---	---	---	---
<b>ED037P: Alkalinity by PC Titrator</b>									
Hydroxide Alkalinity as CaCO <sub>3</sub>	DMO-210-001	1	mg/L	<1	---	---	---	---	---
Carbonate Alkalinity as CaCO <sub>3</sub>	3812-32-6	1	mg/L	<1	---	---	---	---	---
Bicarbonate Alkalinity as CaCO <sub>3</sub>	71-52-3	1	mg/L	<1	---	---	---	---	---
Total Alkalinity as CaCO <sub>3</sub>	---	1	mg/L	<1	---	---	---	---	---
<b>ED041G: Sulfate (Turbidimetric) as SO<sub>4</sub> 2- by DA</b>									
Sulfate as SO <sub>4</sub> - Turbidimetric	14808-79-8	1	mg/L	6	---	---	---	---	---
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L	16	---	---	---	---	---
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L	2	---	---	---	---	---
Magnesium	7439-95-4	1	mg/L	2	---	---	---	---	---
Sodium	7440-23-5	1	mg/L	12	---	---	---	---	---
Potassium	7440-09-7	1	mg/L	<1	---	---	---	---	---
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Arsenic	7440-38-2	0.001	mg/L	<0.001	---	---	---	---	---
Boron	7440-42-8	0.05	mg/L	<0.05	---	---	---	---	---
Barium	7440-39-3	0.001	mg/L	0.005	---	---	---	---	---
Beryllium	7440-41-7	0.001	mg/L	<0.001	---	---	---	---	---
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	---	---	---	---	---
Cobalt	7440-48-4	0.001	mg/L	0.002	---	---	---	---	---
Chromium	7440-47-3	0.001	mg/L	0.001	---	---	---	---	---
Copper	7440-50-8	0.001	mg/L	<0.001	---	---	---	---	---
Manganese	7439-96-5	0.001	mg/L	0.110	---	---	---	---	---
Nickel	7440-02-0	0.001	mg/L	0.004	---	---	---	---	---
Lead	7439-92-1	0.001	mg/L	<0.001	---	---	---	---	---
Selenium	7782-49-2	0.01	mg/L	<0.01	---	---	---	---	---

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID	SW2	---	---	---	---	---
		Sampling date / time	17-Mar-2021 00:00	---	---	---	---	---
Compound		CAS Number	LOR	Unit	ES2109522-016	-----	-----	-----
				Result	---	---	---	---
<b>EG020F: Dissolved Metals by ICP-MS - Continued</b>								
Vanadium	7440-62-2	0.01	mg/L	<0.01	---	---	---	---
Zinc	7440-66-6	0.005	mg/L	0.097	---	---	---	---
Iron	7439-89-6	0.05	mg/L	0.62	---	---	---	---
<b>EG035F: Dissolved Mercury by FIMS</b>								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	---	---	---	---
<b>EK040P: Fluoride by PC Titrator</b>								
Fluoride	16984-48-8	0.1	mg/L	0.2	---	---	---	---
<b>EN055: Ionic Balance</b>								
ø Total Anions	---	0.01	meq/L	0.58	---	---	---	---
ø Total Cations	---	0.01	meq/L	0.79	---	---	---	---
<b>EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup</b>								
C10 - C14 Fraction	---	50	µg/L	<50	---	---	---	---
C15 - C28 Fraction	---	100	µg/L	<100	---	---	---	---
C29 - C36 Fraction	---	50	µg/L	<50	---	---	---	---
^ C10 - C36 Fraction (sum)	---	50	µg/L	<50	---	---	---	---
<b>EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup</b>								
>C10 - C16 Fraction	---	100	µg/L	<100	---	---	---	---
>C16 - C34 Fraction	---	100	µg/L	<100	---	---	---	---
>C34 - C40 Fraction	---	100	µg/L	<100	---	---	---	---
^ >C10 - C40 Fraction (sum)	---	100	µg/L	<100	---	---	---	---
>C10 - C16 Fraction minus Naphthalene (F2)	---	100	µg/L	<100	---	---	---	---
<b>EP080/071: Total Petroleum Hydrocarbons</b>								
C6 - C9 Fraction	---	20	µg/L	<20	---	---	---	---
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	---	---	---	---
^ C6 - C10 Fraction minus BTEX	C6_C10-BTEX	20	µg/L	<20	---	---	---	---
<b>EP080: BTEXN</b>								
Benzene	71-43-2	1	µg/L	<1	---	---	---	---
Toluene	108-88-3	2	µg/L	<2	---	---	---	---
Ethylbenzene	100-41-4	2	µg/L	<2	---	---	---	---
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	---	---	---	---
ortho-Xylene	95-47-6	2	µg/L	<2	---	---	---	---

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID	SW2	---	---	---	---	---
Compound	CAS Number	LOR	Sampling date / time	17-Mar-2021 00:00	---	---	---	---
			Unit	ES2109522-016	-----	-----	-----	-----
<b>EP080: BTEXN - Continued</b>								
^ Total Xylenes	---	2	µg/L	<2	---	---	---	---
^ Sum of BTEX	---	1	µg/L	<1	---	---	---	---
Naphthalene	91-20-3	5	µg/L	<5	---	---	---	---
<b>EP231A: Perfluoroalkyl Sulfonic Acids</b>								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	---	---	---	---
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	---	---	---	---
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	---	---	---	---
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	---	---	---	---
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	---	---	---	---
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	---	---	---	---
<b>EP231B: Perfluoroalkyl Carboxylic Acids</b>								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	---	---	---	---
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	---	---	---	---
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	---	---	---	---
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	---	---	---	---
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	---	---	---	---
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	---	---	---	---
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	---	---	---	---
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	---	---	---	---
Perfluorododecanoic acid (PFDaDA)	307-55-1	0.02	µg/L	<0.02	---	---	---	---
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	---	---	---	---
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	---	---	---	---
<b>EP231C: Perfluoroalkyl Sulfonamides</b>								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	---	---	---	---

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID	SW2	---	---	---	---	---
Compound	CAS Number	LOR	Sampling date / time	17-Mar-2021 00:00	---	---	---	---
			Unit	ES2109522-016	-----	-----	-----	-----
<b>EP231C: Perfluoroalkyl Sulfonamides - Continued</b>								
N-Methyl perfluoroctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	---	---	---	---
N-Ethyl perfluoroctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	---	---	---	---
N-Methyl perfluoroctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	---	---	---	---
N-Ethyl perfluoroctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	---	---	---	---
N-Methyl perfluoroctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	---	---	---	---
N-Ethyl perfluoroctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	---	---	---	---
<b>EP231D: (n:2) Fluorotelomer Sulfonic Acids</b>								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	---	---	---	---
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	---	---	---	---
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	---	---	---	---
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	---	---	---	---
<b>EP231P: PFAS Sums</b>								
Sum of PFAS	---	0.01	µg/L	<0.01	---	---	---	---
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	---	---	---	---
Sum of PFAS (WA DER List)	---	0.01	µg/L	<0.01	---	---	---	---
<b>EP080S: TPH(V)/BTEX Surrogates</b>								
1,2-Dichloroethane-D4	17060-07-0	2	%	114	---	---	---	---
Toluene-D8	2037-26-5	2	%	109	---	---	---	---
4-Bromofluorobenzene	460-00-4	2	%	110	---	---	---	---
<b>EP231S: PFAS Surrogate</b>								
13C4-PFOS	---	0.02	%	85.5	---	---	---	---
13C8-PFOA	---	0.02	%	94.3	---	---	---	---

## Surrogate Control Limits

Sub-Matrix: WATER

Compound	CAS Number	Recovery Limits (%)	
		Low	High
<b>EP080S: TPH(V)/BTEX Surrogates</b>			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128
<b>EP231S: PFAS Surrogate</b>			
13C4-PFOS	---	60	120
13C8-PFOA	---	60	120

## QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES2109522	Page	: 1 of 11
Client	: KLEINFELDER AUSTRALIA PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: DANIEL KOUSBROEK	Telephone	: +6138549 9630
Project	: 20193820	Date Samples Received	: 17-Mar-2021
Site	: WSS-Cabbage Tree Rd Water monitoring	Issue Date	: 25-Mar-2021
Sampler	: Dan Kousbroek	No. of samples received	: 16
Order number	: ----	No. of samples analysed	: 16

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.

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### ***Summary of Outliers***

#### ***Outliers : Quality Control Samples***

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

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

#### ***Outliers : Analysis Holding Time Compliance***

- Analysis Holding Time Outliers exist - please see following pages for full details.

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

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

## Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: WATER

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
<b>Matrix Spike (MS) Recoveries</b>							
EP231A: Perfluoroalkyl Sulfonic Acids	ES2109464--001	Anonymous	Perfluorohexane sulfonic acid (PFHxS)	355-46-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231A: Perfluoroalkyl Sulfonic Acids	ES2109464--001	Anonymous	Perfluoroctane sulfonic acid (PFOS)	1763-23-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

## Outliers : Analysis Holding Time Compliance

Matrix: WATER

Method	Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
<b>EA005P: pH by PC Titrator</b>							
Clear Plastic Bottle - Natural	BH1, BH4, BH7, BH9A, SW1, SW4, SW2	BH2, BH6, BH8, BH11, SW3, MW239S,	----	----	----	21-Mar-2021	17-Mar-2021

## Outliers : Frequency of Quality Control Samples

Matrix: WATER

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
	Method	QC	Regular	Actual	Expected
<b>Laboratory Duplicates (DUP)</b>					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	2	31	6.45	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	0	16	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
<b>Matrix Spikes (MS)</b>					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	31	3.23	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	0	16	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	
<b>EA005P: pH by PC Titrator</b>									
Clear Plastic Bottle - Natural (EA005-P)	BH1, BH4, BH7, BH9A, SW1, SW4, SW2	BH2, BH6, BH8, BH11, SW3, MW239S,	17-Mar-2021	----	----	---	21-Mar-2021	17-Mar-2021	✗
<b>EA010P: Conductivity by PC Titrator</b>									
Clear Plastic Bottle - Natural (EA010-P)	BH1, BH4, BH7, BH9A, SW1, SW4, SW2	BH2, BH6, BH8, BH11, SW3, MW239S,	17-Mar-2021	----	----	---	21-Mar-2021	14-Apr-2021	✓
<b>EA065: Total Hardness as CaCO<sub>3</sub></b>									
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)	BH1, BH4, BH7, BH9A, SW1, SW4, SW2	BH2, BH6, BH8, BH11, SW3, MW239S,	17-Mar-2021	----	----	---	21-Mar-2021	14-Apr-2021	✓
<b>ED037P: Alkalinity by PC Titrator</b>									
Clear Plastic Bottle - Natural (ED037-P)	BH1, BH4, BH7, BH9A, SW1, SW4, SW2	BH2, BH6, BH8, BH11, SW3, MW239S,	17-Mar-2021	----	----	---	21-Mar-2021	31-Mar-2021	✓

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	
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>									
Clear Plastic Bottle - Natural (ED041G)	BH1, BH4, BH7, BH9A, SW1, SW4, SW2	BH2, BH6, BH8, BH11, SW3, MW239S,	17-Mar-2021	----	----	----	22-Mar-2021	14-Apr-2021	✓
<b>ED045G: Chloride by Discrete Analyser</b>									
Clear Plastic Bottle - Natural (ED045G)	BH1, BH4, BH7, BH9A, SW1, SW4, SW2	BH2, BH6, BH8, BH11, SW3, MW239S,	17-Mar-2021	----	----	----	22-Mar-2021	14-Apr-2021	✓
<b>ED093F: Dissolved Major Cations</b>									
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)	BH1, BH4, BH7, BH9A, SW1, SW4, SW2	BH2, BH6, BH8, BH11, SW3, MW239S,	17-Mar-2021	----	----	----	21-Mar-2021	14-Apr-2021	✓
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)	BH1, BH4, BH7, BH9A, SW1, SW4, QW40, SW2	BH2, BH6, BH8, BH11, SW3, MW239S, QW41,	17-Mar-2021	----	----	----	21-Mar-2021	13-Sep-2021	✓

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						
<b>EG035F: Dissolved Mercury by FIMS</b>														
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)	BH1, BH4, BH7, BH9A, SW1, SW4, QW40, SW2	BH2, BH6, BH8, BH11, SW3, MW239S, QW41,	17-Mar-2021	----	----	---	23-Mar-2021	14-Apr-2021	✓					
<b>EK040P: Fluoride by PC Titrator</b>														
Clear Plastic Bottle - Natural (EK040P)	BH1, BH4, BH7, BH9A, SW1, SW4, SW2	BH2, BH6, BH8, BH11, SW3, MW239S,	17-Mar-2021	----	----	---	21-Mar-2021	14-Apr-2021	✓					
<b>EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup</b>														
Amber Glass Bottle - Unpreserved (EP071SG)	BH1, BH4, BH7, BH9A, BH12, SW3, MW239S, QW41,	BH2, BH6, BH8, BH11, SW1, SW4, QW40, SW2	17-Mar-2021	22-Mar-2021	24-Mar-2021	✓	23-Mar-2021	01-May-2021	✓					
<b>EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup</b>														
Amber Glass Bottle - Unpreserved (EP071SG)	BH1, BH4, BH7, BH9A, BH12, SW3, MW239S, QW41,	BH2, BH6, BH8, BH11, SW1, SW4, QW40, SW2	17-Mar-2021	22-Mar-2021	24-Mar-2021	✓	23-Mar-2021	01-May-2021	✓					

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						
<b>EP080/071: Total Petroleum Hydrocarbons</b>														
Amber VOC Vial - Sulfuric Acid (EP080)	BH1, BH4, BH7, BH9A, BH12, SW3, MW239S, QW41,	BH2, BH6, BH8, BH11, SW1, SW4, QW40, SW2	17-Mar-2021	22-Mar-2021	31-Mar-2021	✓	22-Mar-2021	31-Mar-2021	✓					
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>														
Amber VOC Vial - Sulfuric Acid (EP080)	BH1, BH4, BH7, BH9A, BH12, SW3, MW239S, QW41,	BH2, BH6, BH8, BH11, SW1, SW4, QW40, SW2	17-Mar-2021	22-Mar-2021	31-Mar-2021	✓	22-Mar-2021	31-Mar-2021	✓					
<b>EP080: BTEXN</b>														
Amber VOC Vial - Sulfuric Acid (EP080)	BH1, BH4, BH7, BH9A, BH12, SW3, MW239S, QW41,	BH2, BH6, BH8, BH11, SW1, SW4, QW40, SW2	17-Mar-2021	22-Mar-2021	31-Mar-2021	✓	22-Mar-2021	31-Mar-2021	✓					
<b>EP231A: Perfluoroalkyl Sulfonic Acids</b>														
HDPE (no PTFE) (EP231X)	BH1, BH4, BH7, BH9A, SW1, SW4, QW40, SW2	BH2, BH6, BH8, BH11, SW3, MW239S, QW41,	17-Mar-2021	19-Mar-2021	13-Sep-2021	✓	19-Mar-2021	13-Sep-2021	✓					

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						
<b>EP231B: Perfluoroalkyl Carboxylic Acids</b>														
HDPE (no PTFE) (EP231X)	BH1, BH4, BH7, BH9A, SW1, SW4, QW40, SW2	BH2, BH6, BH8, BH11, SW3, MW239S, QW41,	17-Mar-2021	19-Mar-2021	13-Sep-2021	✓	19-Mar-2021	13-Sep-2021	✓					
<b>EP231C: Perfluoroalkyl Sulfonamides</b>														
HDPE (no PTFE) (EP231X)	BH1, BH4, BH7, BH9A, SW1, SW4, QW40, SW2	BH2, BH6, BH8, BH11, SW3, MW239S, QW41,	17-Mar-2021	19-Mar-2021	13-Sep-2021	✓	19-Mar-2021	13-Sep-2021	✓					
<b>EP231D: (n:2) Fluorotelomer Sulfonic Acids</b>														
HDPE (no PTFE) (EP231X)	BH1, BH4, BH7, BH9A, SW1, SW4, QW40, SW2	BH2, BH6, BH8, BH11, SW3, MW239S, QW41,	17-Mar-2021	19-Mar-2021	13-Sep-2021	✓	19-Mar-2021	13-Sep-2021	✓					
<b>EP231P: PFAS Sums</b>														
HDPE (no PTFE) (EP231X)	BH1, BH4, BH7, BH9A, SW1, SW4, QW40, SW2	BH2, BH6, BH8, BH11, SW3, MW239S, QW41,	17-Mar-2021	19-Mar-2021	13-Sep-2021	✓	19-Mar-2021	13-Sep-2021	✓					

## 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	Analytical Methods	Method	Count		Rate (%)		Quality Control Specification
			QC	Regular	Actual	Expected	
<b>Laboratory Duplicates (DUP)</b>							
Alkalinity by PC Titrator		ED037-P	4	40	10.00	10.00	✓ NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser		ED045G	2	13	15.38	10.00	✓ NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator		EA010-P	5	43	11.63	10.00	✓ NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS		EG035F	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
Fluoride by PC Titrator		EK040P	4	40	10.00	10.00	✓ NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved		ED093F	2	18	11.11	10.00	✓ NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS		EP231X	2	31	6.45	10.00	✗ NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator		EA005-P	2	15	13.33	10.00	✓ NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser		ED041G	2	20	10.00	10.00	✓ NEPM 2013 B3 & ALS QC Standard
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup		EP071SG	0	16	0.00	10.00	✗ NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX		EP080	2	20	10.00	10.00	✓ NEPM 2013 B3 & ALS QC Standard
<b>Laboratory Control Samples (LCS)</b>							
Alkalinity by PC Titrator		ED037-P	4	40	10.00	10.00	✓ NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser		ED045G	2	13	15.38	10.00	✓ NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator		EA010-P	4	43	9.30	8.33	✓ NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS		EG035F	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
Fluoride by PC Titrator		EK040P	2	40	5.00	5.00	✓ NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved		ED093F	1	18	5.56	5.00	✓ NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS		EP231X	2	31	6.45	5.00	✓ NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator		EA005-P	2	15	13.33	10.00	✓ NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser		ED041G	2	20	10.00	10.00	✓ NEPM 2013 B3 & ALS QC Standard
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup		EP071SG	1	16	6.25	5.00	✓ NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX		EP080	1	20	5.00	5.00	✓ NEPM 2013 B3 & ALS QC Standard
<b>Method Blanks (MB)</b>							
Chloride by Discrete Analyser		ED045G	1	13	7.69	5.00	✓ NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator		EA010-P	1	43	2.33	1.67	✓ NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS		EG035F	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
Fluoride by PC Titrator		EK040P	2	40	5.00	5.00	✓ NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved		ED093F	1	18	5.56	5.00	✓ NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS		EP231X	2	31	6.45	5.00	✓ NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser		ED041G	1	20	5.00	5.00	✓ NEPM 2013 B3 & ALS QC Standard

Matrix: WATER							Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.
Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
<b>Method Blanks (MB) - Continued</b>							
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	EP071SG	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
<b>Matrix Spikes (MS)</b>							
Chloride by Discrete Analyser	ED045G	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	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
Fluoride by PC Titrator	EK040P	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	31	3.23	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	EP071SG	0	16	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard

## Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Conductivity by PC Titrator	EA010-P	WATER	In house: Referenced to APHA 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM Schedule B(3)
Calculated TDS (from Electrical Conductivity)	EA016	WATER	In house: Calculation from Electrical Conductivity (APHA 2510 B) using a conversion factor specified in the analytical report. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. in the presence of ferric ions the librated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45μm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45μm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Fluoride by PC Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)

Analytical Methods			
	Method	Matrix	Method Descriptions
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	EP071SG	WATER	In house: Referenced to USEPA SW 846 - 8015 Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C36. This method is compliant with NEPM Schedule B(3).
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods			
	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

## QUALITY CONTROL REPORT

Work Order	: ES2109522	Page	: 1 of 13
Client	: KLEINFELDER AUSTRALIA PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: DANIEL KOUSBROEK	Contact	: Shirley LeCornu
Address	: 95 Mitchell Rd Cardiff 2285	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +6138549 9630
Project	: 20193820	Date Samples Received	: 17-Mar-2021
Order number	: ----	Date Analysis Commenced	: 19-Mar-2021
C-O-C number	: ----	Issue Date	: 25-Mar-2021
Sampler	: Dan Kousbroek		
Site	: WSS-Cabbage Tree Rd Water monitoring		
Quote number	: ME/114/19 ALS Compass		
No. of samples received	: 16		
No. of samples analysed	: 16		

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

This Quality Control Report contains the following information:

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

### **Signatories**

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW



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

## 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

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 (%)
<b>EA005P: pH by PC Titrator (QC Lot: 3576480)</b>									
ES2109495-006	Anonymous	EA005-P: pH Value	---	0.01	pH Unit	7.91	7.98	0.881	0% - 20%
ES2109522-007	BH9A	EA005-P: pH Value	---	0.01	pH Unit	5.23	5.00	4.50	0% - 20%
<b>EA010P: Conductivity by PC Titrator (QC Lot: 3576481)</b>									
ES2109495-006	Anonymous	EA010-P: Electrical Conductivity @ 25°C	---	1	µS/cm	1180	1200	1.44	0% - 20%
ES2109693-002	Anonymous	EA010-P: Electrical Conductivity @ 25°C	---	1	µS/cm	18400	18400	0.275	0% - 20%
ES2109956-002	Anonymous	EA010-P: Electrical Conductivity @ 25°C	---	1	µS/cm	467	464	0.668	0% - 20%
ES2109522-007	BH9A	EA010-P: Electrical Conductivity @ 25°C	---	1	µS/cm	164	163	0.757	0% - 20%
ES2109693-013	Anonymous	EA010-P: Electrical Conductivity @ 25°C	---	1	µS/cm	10	11	10.4	0% - 50%
<b>ED037P: Alkalinity by PC Titrator (QC Lot: 3576478)</b>									
ES2109450-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO <sub>3</sub>	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO <sub>3</sub>	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO <sub>3</sub>	71-52-3	1	mg/L	222	238	6.88	0% - 20%
		ED037-P: Total Alkalinity as CaCO <sub>3</sub>	---	1	mg/L	222	238	6.88	0% - 20%
ES2109495-006	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO <sub>3</sub>	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO <sub>3</sub>	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO <sub>3</sub>	71-52-3	1	mg/L	281	290	2.88	0% - 20%
		ED037-P: Total Alkalinity as CaCO <sub>3</sub>	---	1	mg/L	281	290	2.88	0% - 20%
<b>ED037P: Alkalinity by PC Titrator (QC Lot: 3576482)</b>									
ES2109693-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO <sub>3</sub>	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO <sub>3</sub>	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO <sub>3</sub>	71-52-3	1	mg/L	1120	1130	0.373	0% - 20%
		ED037-P: Total Alkalinity as CaCO <sub>3</sub>	---	1	mg/L	1120	1130	0.373	0% - 20%
ES2109522-007	BH9A	ED037-P: Hydroxide Alkalinity as CaCO <sub>3</sub>	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO <sub>3</sub>	3812-32-6	1	mg/L	<1	<1	0.00	No Limit

**Sub-Matrix: WATER**

		Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
<b>ED037P: Alkalinity by PC Titrator (QC Lot: 3576482) - continued</b>									
ES2109522-007	BH9A	ED037-P: Bicarbonate Alkalinity as CaCO <sub>3</sub>	71-52-3	1	mg/L	4	1	104	No Limit
		ED037-P: Total Alkalinity as CaCO <sub>3</sub>	----	1	mg/L	4	1	104	No Limit
<b>ED041G: Sulfate (Turbidimetric) as SO<sub>4</sub> 2- by DA (QC Lot: 3577060)</b>									
ES2109522-001	BH1	ED041G: Sulfate as SO <sub>4</sub> - Turbidimetric	14808-79-8	1	mg/L	4	4	0.00	No Limit
ES2109522-011	SW3	ED041G: Sulfate as SO <sub>4</sub> - Turbidimetric	14808-79-8	1	mg/L	15	15	0.00	0% - 50%
<b>ED045G: Chloride by Discrete Analyser (QC Lot: 3577061)</b>									
ES2109522-001	BH1	ED045G: Chloride	16887-00-6	1	mg/L	23	23	0.00	0% - 20%
ES2109522-011	SW3	ED045G: Chloride	16887-00-6	1	mg/L	51	51	0.00	0% - 20%
<b>ED093F: Dissolved Major Cations (QC Lot: 3576506)</b>									
ES2109522-006	BH8	ED093F: Calcium	7440-70-2	1	mg/L	<1	<1	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	6	6	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	50	49	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.00	No Limit
ES2109513-007	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	6	5	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	4	4	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	14	14	0.00	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.00	No Limit
<b>EG020F: Dissolved Metals by ICP-MS (QC Lot: 3576507)</b>									
ES2109522-006	BH8	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.012	0.013	0.00	0% - 50%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.010	0.007	26.8	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.002	0.001	70.2	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	3.86	3.76	2.67	0% - 20%
ES2109513-007	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.017	0.017	0.00	0% - 50%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit

**Sub-Matrix: WATER**

		Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
<b>EG020F: Dissolved Metals by ICP-MS (QC Lot: 3576507) - continued</b>									
ES2109513-007	Anonymous	EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.008	0.007	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.06	0.08	24.7	No Limit
<b>EG035F: Dissolved Mercury by FIMS (QC Lot: 3576505)</b>									
ES2109522-005	BH7	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
ES2109513-007	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
<b>EK040P: Fluoride by PC Titrator (QC Lot: 3576479)</b>									
ES2109495-006	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.4	0.4	0.00	No Limit
ES2109522-007	BH9A	EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	0.00	No Limit
<b>EK040P: Fluoride by PC Titrator (QC Lot: 3576483)</b>									
ES2109693-002	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.7	0.7	0.00	No Limit
ES2109693-013	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	0.00	No Limit
<b>EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3571469)</b>									
ES2109473-001	Anonymous	EP080: C6 - C9 Fraction	---	20	µg/L	<20	<20	0.00	No Limit
ES2109522-007	BH9A	EP080: C6 - C9 Fraction	---	20	µg/L	<20	<20	0.00	No Limit
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3571469)</b>									
ES2109473-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
ES2109522-007	BH9A	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
<b>EP080: BTEXN (QC Lot: 3571469)</b>									
ES2109473-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.00	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
ES2109522-007	BH9A	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.00	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

**Sub-Matrix: WATER**

		Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
<b>EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3571843)</b>									
ES2109331-001	Anonymous	EP231X: Perfluoroctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	4.66	4.80	2.94	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.12	0.13	8.17	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.10	0.10	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	1.34	1.33	0.00	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.11	0.12	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	0.03	0.03	0.00	No Limit
ES2109464-004	Anonymous	EP231X: Perfluoroctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	6.93	6.68	3.75	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.09	0.08	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.13	0.13	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	1.58	1.52	3.62	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.08	0.09	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
<b>EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3571843)</b>									
ES2109331-001	Anonymous	EP231X: Perfluoroctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.14	0.14	0.00	0% - 50%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.06	0.06	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.29	0.30	4.11	0% - 50%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.06	0.06	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	0.03	0.03	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
ES2109464-004	Anonymous	EP231X: Perfluoroctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.12	0.12	0.00	0% - 50%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.13	0.13	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.40	0.40	0.00	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.07	0.07	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
<b>EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3571843)</b>									
ES2109331-001	Anonymous	EP231X: Perfluoroctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	0.03	0.03	0.00	No Limit
		EP231X: N-Methyl perfluoroctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit



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Work Order : ES2109522  
Client : KLEINFELDER AUSTRALIA PTY LTD  
Project : 20193820



Sub-Matrix: WATER

Laboratory Duplicate (DUP) Report

Laboratory Duplicate (DUP) Report									
<b>EP231P: PFAS Sums (QC Lot: 3571843) - continued</b>									
ES2109331-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	7.17	7.32	2.07	0% - 20%
ES2109464-004	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	9.60	9.29	3.28	0% - 20%

## 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	Result	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
					LCS	Low	High	
<b>EA005P: pH by PC Titrator (QCLot: 3576480)</b>								
EA005-P: pH Value	---	---	pH Unit	---	4 pH Unit 7 pH Unit	99.2 99.6	98.8 99.2	101 101
<b>EA010P: Conductivity by PC Titrator (QCLot: 3576481)</b>								
EA010-P: Electrical Conductivity @ 25°C	---	1	µS/cm	<1 <1	220 µS/cm 2100 µS/cm	91.3 96.2	91.1 93.2	107 108
<b>ED037P: Alkalinity by PC Titrator (QCLot: 3576478)</b>								
ED037-P: Total Alkalinity as CaCO3	---	---	mg/L	---	200 mg/L 50 mg/L	102 104	81.0 80.0	111 120
<b>ED037P: Alkalinity by PC Titrator (QCLot: 3576482)</b>								
ED037-P: Total Alkalinity as CaCO3	---	---	mg/L	---	200 mg/L 50 mg/L	102 106	81.0 80.0	111 120
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3577060)</b>								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1 <1	25 mg/L 500 mg/L	102 102	82.0 82.0	122 122
<b>ED045G: Chloride by Discrete Analyser (QCLot: 3577061)</b>								
ED045G: Chloride	16887-00-6	1	mg/L	<1 <1	50 mg/L 1000 mg/L	95.2 94.8	80.9 80.9	127 127
<b>ED093F: Dissolved Major Cations (QCLot: 3576506)</b>								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	95.4	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	98.0	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	97.2	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	90.5	85.0	113
<b>EG020F: Dissolved Metals by ICP-MS (QCLot: 3576507)</b>								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	95.1	85.0	114
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	88.9	85.0	115
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	94.1	82.0	110
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	98.8	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	91.4	85.0	111
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	86.0	82.0	112
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	90.6	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	90.7	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	84.5	82.0	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	88.3	82.0	112
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	87.1	85.0	115

**Sub-Matrix: WATER**

<b>Method: Compound</b>	<b>CAS Number</b>	<b>LOR</b>	<b>Unit</b>	<b>Result</b>	<b>Method Blank (MB) Report</b>	<b>Laboratory Control Spike (LCS) Report</b>		
					<b>Spike Concentration</b>	<b>Spike Recovery (%)</b>	<b>Acceptable Limits (%)</b>	
					<b>LCS</b>	<b>Low</b>	<b>High</b>	
<b>EG020F: Dissolved Metals by ICP-MS (QCLot: 3576507) - continued</b>								
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	92.9	83.0	109
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	92.9	81.0	117
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	87.9	85.0	115
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	86.4	82.0	112
<b>EG035F: Dissolved Mercury by FIMS (QCLot: 3576505)</b>								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	90.4	83.0	105
<b>EK040P: Fluoride by PC Titrator (QCLot: 3576479)</b>								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	96.6	82.0	116
<b>EK040P: Fluoride by PC Titrator (QCLot: 3576483)</b>								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	99.0	82.0	116
<b>EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup (QCLot: 3571041)</b>								
EP071SG: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	84.7	55.8	112
EP071SG: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	111	71.6	113
EP071SG: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	99.8	56.0	121
<b>EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup (QCLot: 3571041)</b>								
EP071SG: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	90.3	57.9	119
EP071SG: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	92.1	62.5	110
EP071SG: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	102	61.5	121
<b>EP080/071: Total Petroleum Hydrocarbons (QCLot: 3571469)</b>								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	86.1	75.0	127
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3571469)</b>								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	87.8	75.0	127
<b>EP080: BTEXN (QCLot: 3571469)</b>								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	94.6	70.0	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	97.6	69.0	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	97.9	70.0	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	96.3	69.0	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	97.0	72.0	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	101	70.0	120
<b>EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3571843)</b>								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	104	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	99.0	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	108	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	114	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	104	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	120	53.0	142

Sub-Matrix: WATER

Method: Compound	CAS Number	LOR	Unit	Result	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
					LCS	Low	High	
<b>EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3572333)</b>								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	111	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	123	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	107	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	117	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	109	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	127	53.0	142
<b>EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3571843)</b>								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	106	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	113	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	119	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	116	72.0	130
EP231X: Perfluoroctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	119	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	112	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	116	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	123	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	113	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	126	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	105	71.0	132
<b>EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3572333)</b>								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	98.6	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	117	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	122	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	118	72.0	130
EP231X: Perfluoroctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	117	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	127	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	129	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	128	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	111	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	111	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	110	71.0	132
<b>EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3571843)</b>								
EP231X: Perfluoroctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	103	67.0	137
EP231X: N-Methyl perfluoroctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	94.2	68.0	141
EP231X: N-Ethyl perfluoroctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	85.4	62.6	147
EP231X: N-Methyl perfluoroctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	102	66.0	145
EP231X: N-Ethyl perfluoroctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	101	57.6	145

**Sub-Matrix: WATER**

<b>Method: Compound</b>	<b>CAS Number</b>	<b>LOR</b>	<b>Unit</b>	<b>Result</b>	<b>Method Blank (MB) Report</b>	<b>Laboratory Control Spike (LCS) Report</b>		
					<b>Spike Concentration</b>	<b>Spike Recovery (%)</b>	<b>Acceptable Limits (%)</b>	
					<b>LCS</b>	<b>Low</b>	<b>High</b>	
<b>EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3571843) - continued</b>								
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	127	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	109	61.0	135
<b>EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3572333)</b>								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	111	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	125	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	116	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	124	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	103	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	115	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	112	61.0	135
<b>EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3571843)</b>								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	128	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	127	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	122	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	104	71.4	144
<b>EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3572333)</b>								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	113	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	93.6	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	121	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	124	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**

<b>Laboratory sample ID</b>	<b>Sample ID</b>	<b>Method: Compound</b>	<b>CAS Number</b>	<b>Matrix Spike (MS) Report</b>			
				<b>Spike</b>	<b>Spike Recovery (%)</b>	<b>Acceptable Limits (%)</b>	
				<b>Concentration</b>	<b>MS</b>	<b>Low</b>	<b>High</b>
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3577060)</b>							
ES2109522-001	BH1	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	98.8	70.0	130
<b>ED045G: Chloride by Discrete Analyser (QC Lot: 3577061)</b>							
ES2109522-001	BH1	ED045G: Chloride	16887-00-6	50 mg/L	88.9	70.0	130

**Sub-Matrix: WATER**

				Matrix Spike (MS) Report				
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Spike	Spike Recovery(%)	Acceptable Limits (%)		
EG020F: Dissolved Metals by ICP-MS (QCLot: 3576507)				Concentration	MS	Low	High	
ES2109513-006	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	116	70.0	130	
		EG020A-F: Beryllium	7440-41-7	1 mg/L	118	70.0	130	
		EG020A-F: Barium	7440-39-3	1 mg/L	121	70.0	130	
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	127	70.0	130	
		EG020A-F: Chromium	7440-47-3	1 mg/L	121	70.0	130	
		EG020A-F: Cobalt	7440-48-4	1 mg/L	115	70.0	130	
		EG020A-F: Copper	7440-50-8	1 mg/L	121	70.0	130	
		EG020A-F: Lead	7439-92-1	1 mg/L	116	70.0	130	
		EG020A-F: Manganese	7439-96-5	1 mg/L	115	70.0	130	
		EG020A-F: Nickel	7440-02-0	1 mg/L	115	70.0	130	
		EG020A-F: Vanadium	7440-62-2	1 mg/L	121	70.0	130	
		EG020A-F: Zinc	7440-66-6	1 mg/L	118	70.0	130	
EG035F: Dissolved Mercury by FIMS (QCLot: 3576505)				7439-97-6	0.01 mg/L	99.8	70.0	130
ES2109513-005	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	99.8	70.0	130	
EK040P: Fluoride by PC Titrator (QCLot: 3576479)				16984-48-8	5 mg/L	92.4	70.0	130
ES2109482-001	Anonymous	EK040P: Fluoride	16984-48-8	5 mg/L	92.4	70.0	130	
EK040P: Fluoride by PC Titrator (QCLot: 3576483)				16984-48-8	5 mg/L	86.2	70.0	130
ES2109522-013	MW239S	EK040P: Fluoride	16984-48-8	5 mg/L	86.2	70.0	130	
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3571469)				---	325 µg/L	93.1	70.0	130
ES2109473-001	Anonymous	EP080: C6 - C9 Fraction	---	325 µg/L	93.1	70.0	130	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3571469)				C6_C10	375 µg/L	89.7	70.0	130
ES2109473-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	89.7	70.0	130	
EP080: BTEXN (QCLot: 3571469)				71-43-2	25 µg/L	99.3	70.0	130
ES2109473-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	99.3	70.0	130	
		EP080: Toluene	108-88-3	25 µg/L	100	70.0	130	
		EP080: Ethylbenzene	100-41-4	25 µg/L	99.1	70.0	130	
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	98.2	70.0	130	
			106-42-3					
		EP080: ortho-Xylene	95-47-6	25 µg/L	99.4	70.0	130	
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3571843)				91-20-3	25 µg/L	101	70.0	130
ES2109464-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	125	72.0	130	
		EP231X: Perfluoropentane sulfonic acid (PPPeS)	2706-91-4	0.25 µg/L	121	71.0	127	
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	# Not Determined	68.0	131	
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	375-92-8	0.25 µg/L	127	69.0	134	

**Sub-Matrix: WATER**

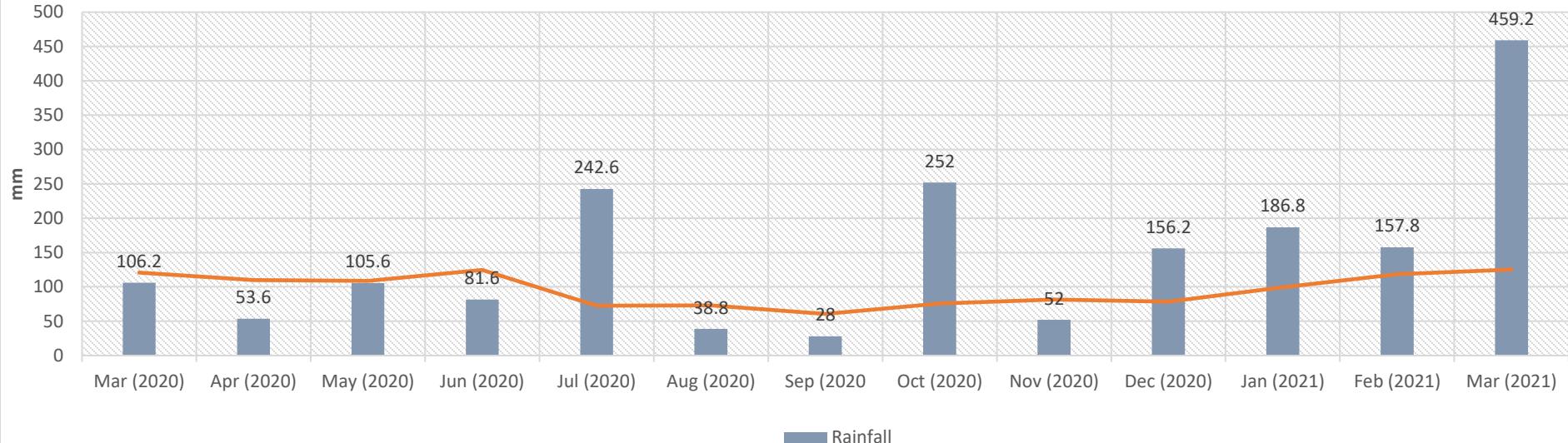
				Matrix Spike (MS) Report			
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Spike	Spike Recovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High
<b>EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3571843) - continued</b>							
ES2109464-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	# Not Determined	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	122	53.0	142
<b>EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3571843)</b>							
ES2109464-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	121	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	119	72.0	129
		EP231X: Perfluorohexanoic acid (PFFhxA)	307-24-4	0.25 µg/L	118	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	124	72.0	130
		EP231X: Perfluoroctanoic acid (PFOA)	335-67-1	0.25 µg/L	122	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	118	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	125	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	128	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	122	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	127	65.0	144
<b>EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3571843)</b>							
ES2109464-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	125	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	128	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	113	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	112	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	118	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	112	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	114	61.0	135
<b>EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3571843)</b>							
ES2109464-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	125	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	133	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	108	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	110	71.4	144



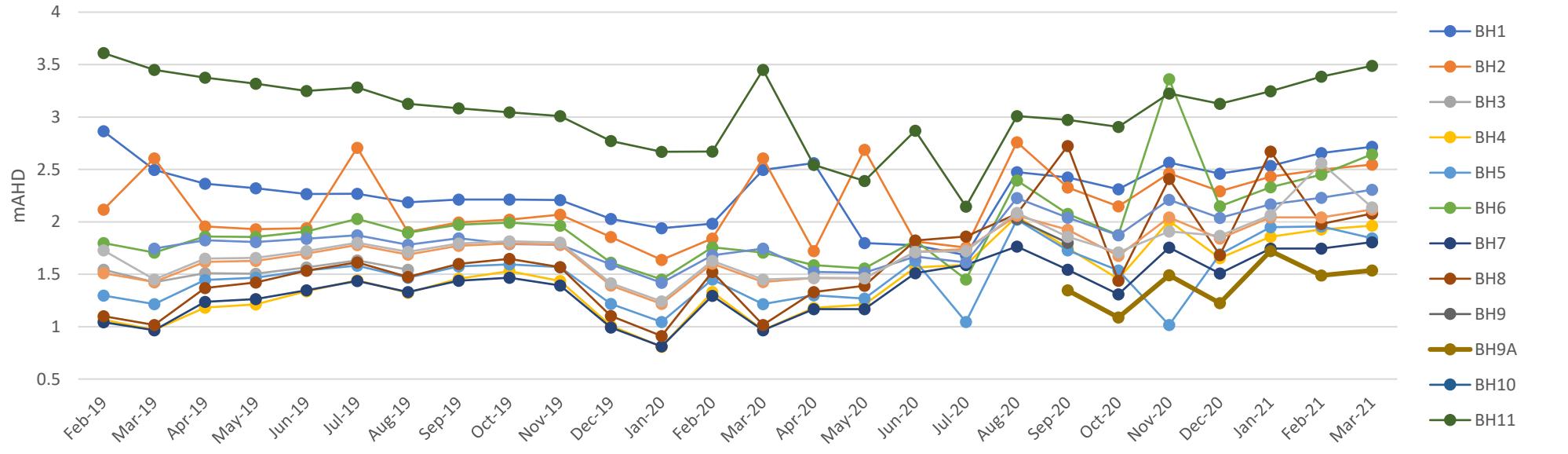
## ATTACHMENT 4: DATA TRENDS



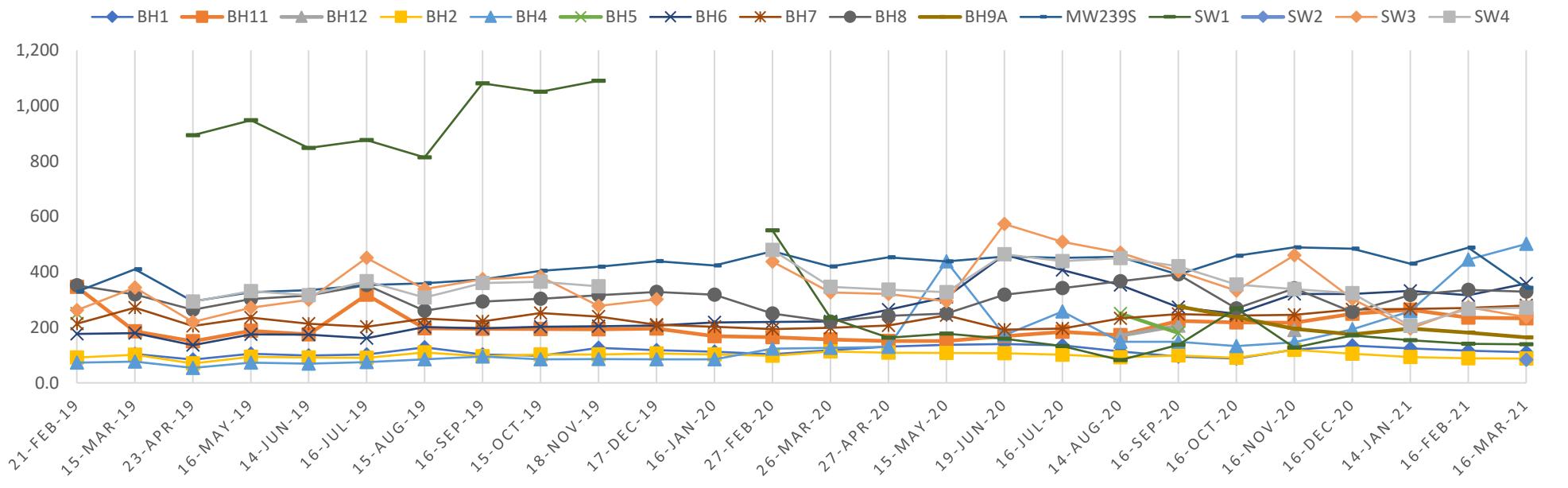
## Monthly Rainfall Totals 2020-2021 (mm)



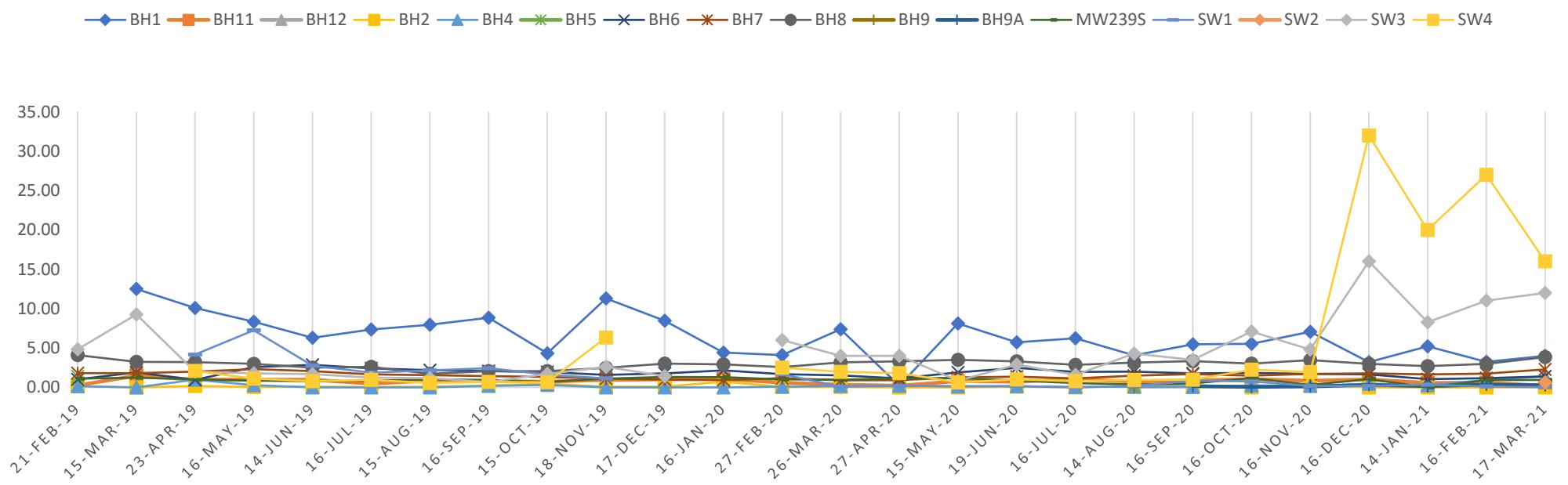
## Groundwater Elevation (mAHD)

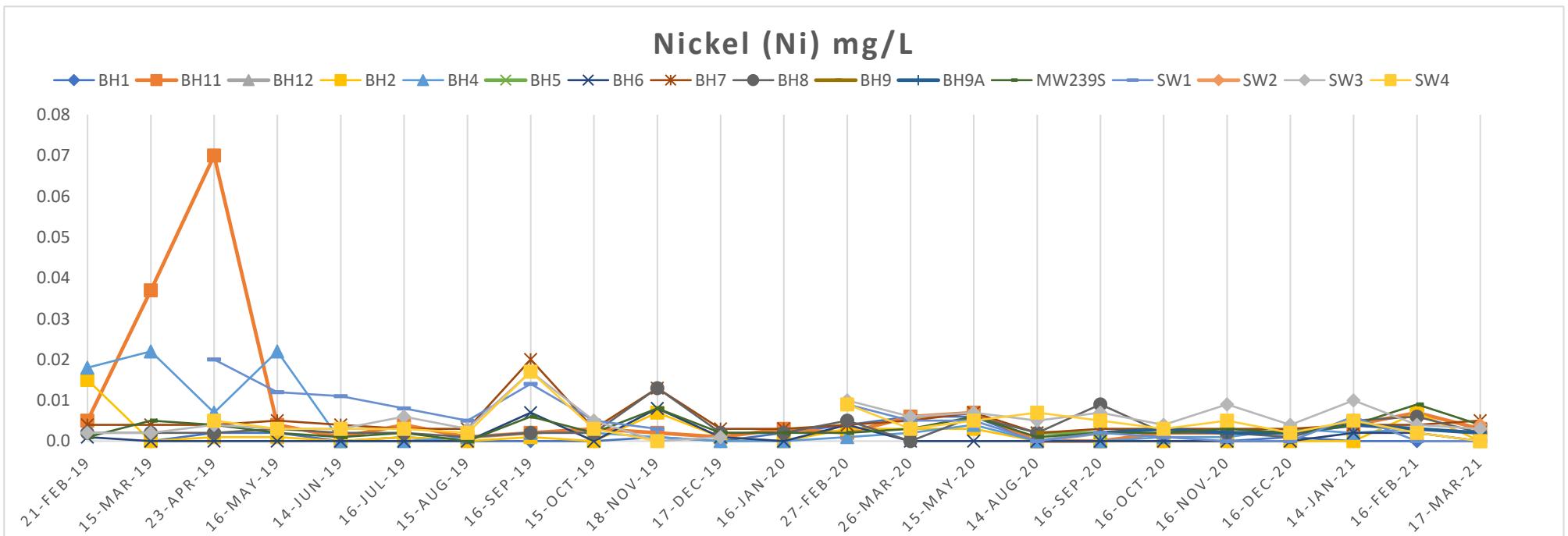
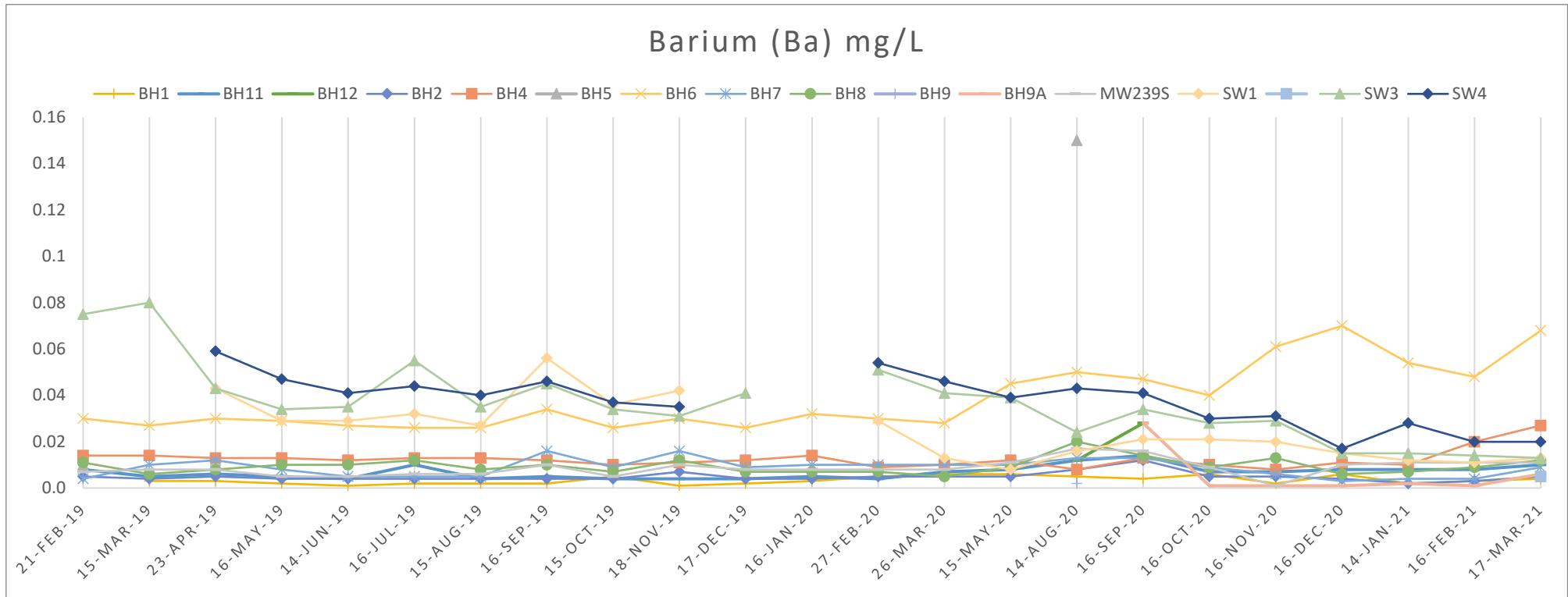


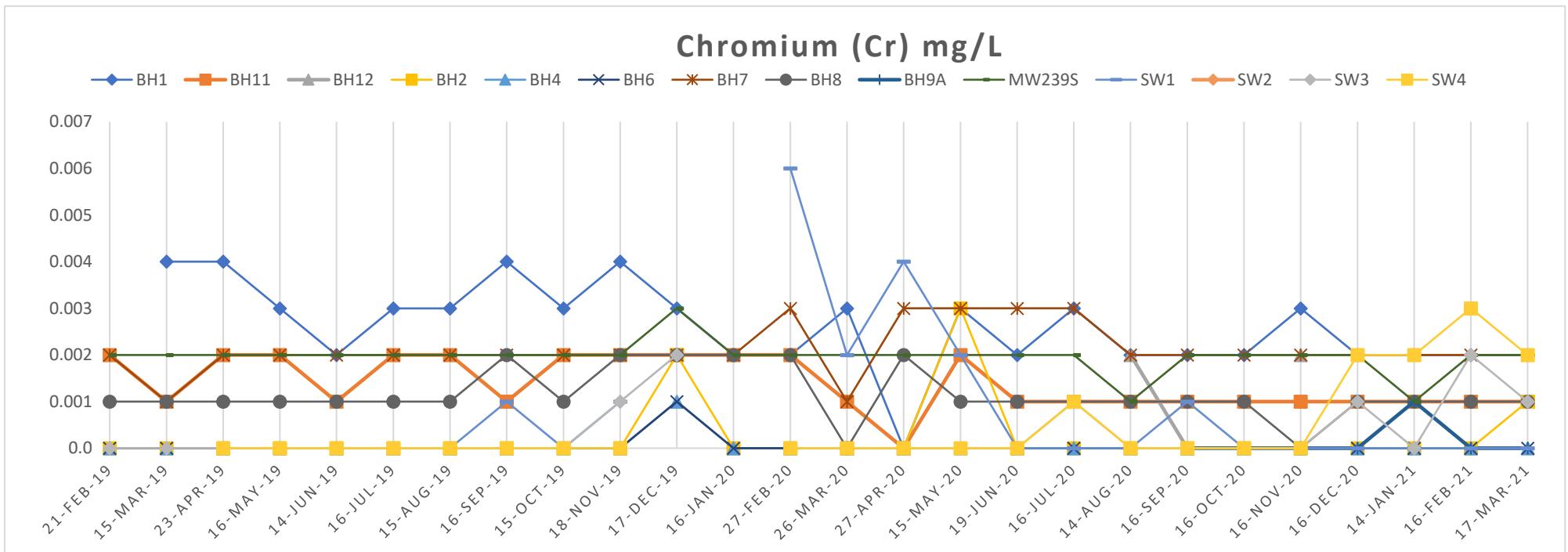
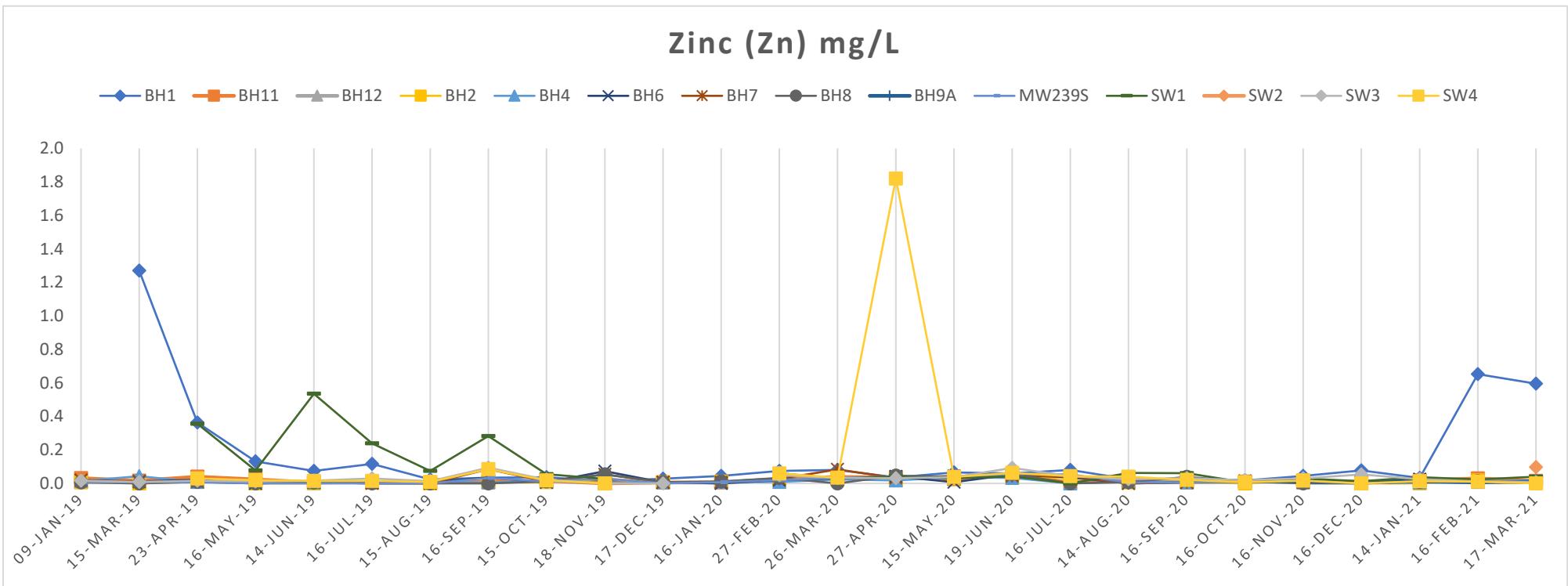
## Laboratory EC ( $\mu\text{S}/\text{cm}$ )

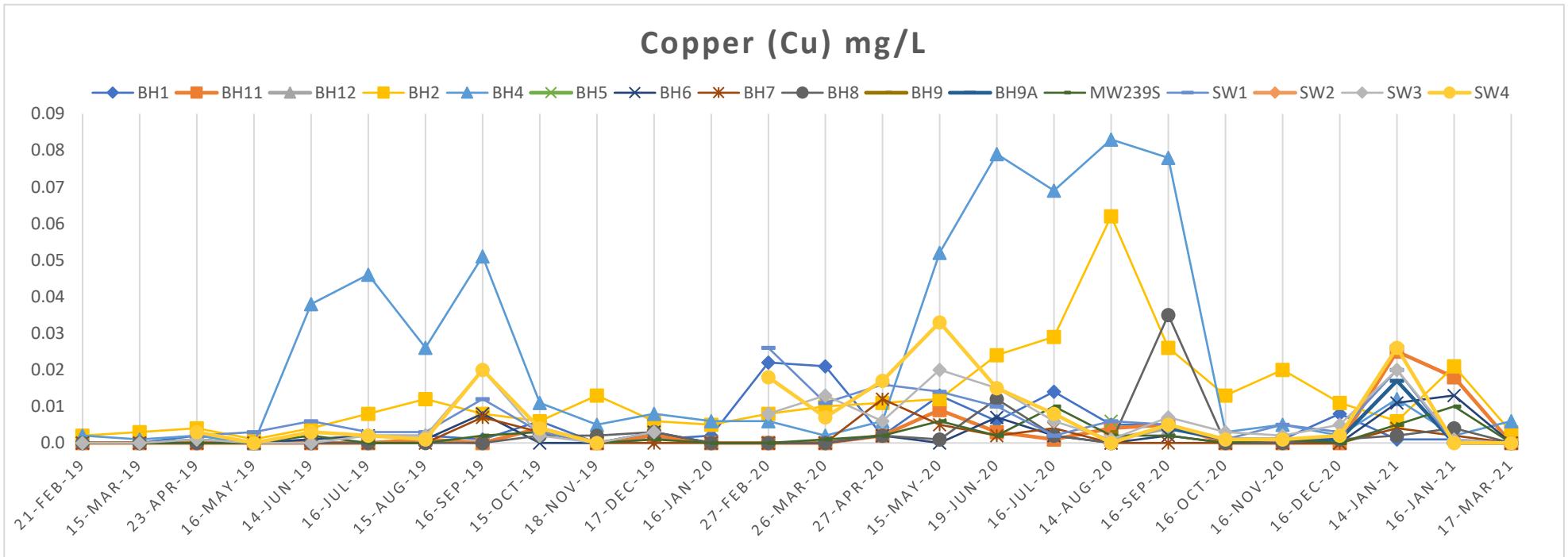
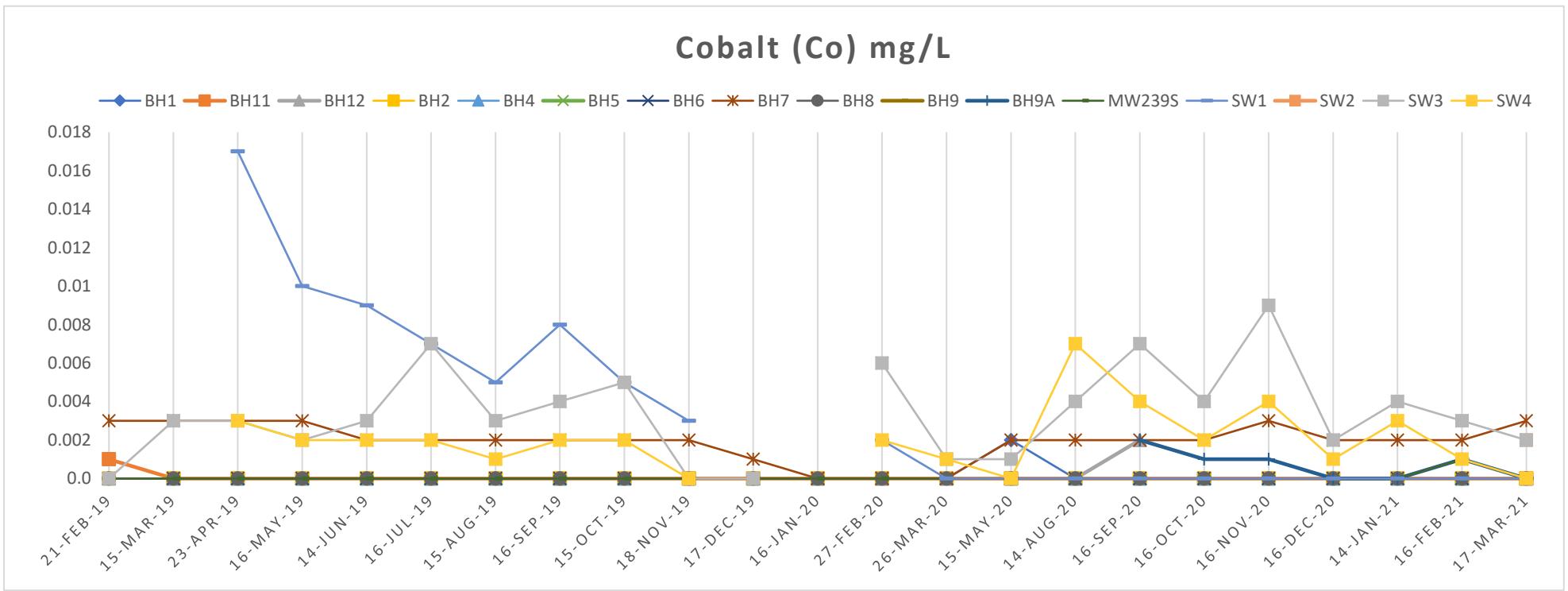


## Iron (Fe) mg/L

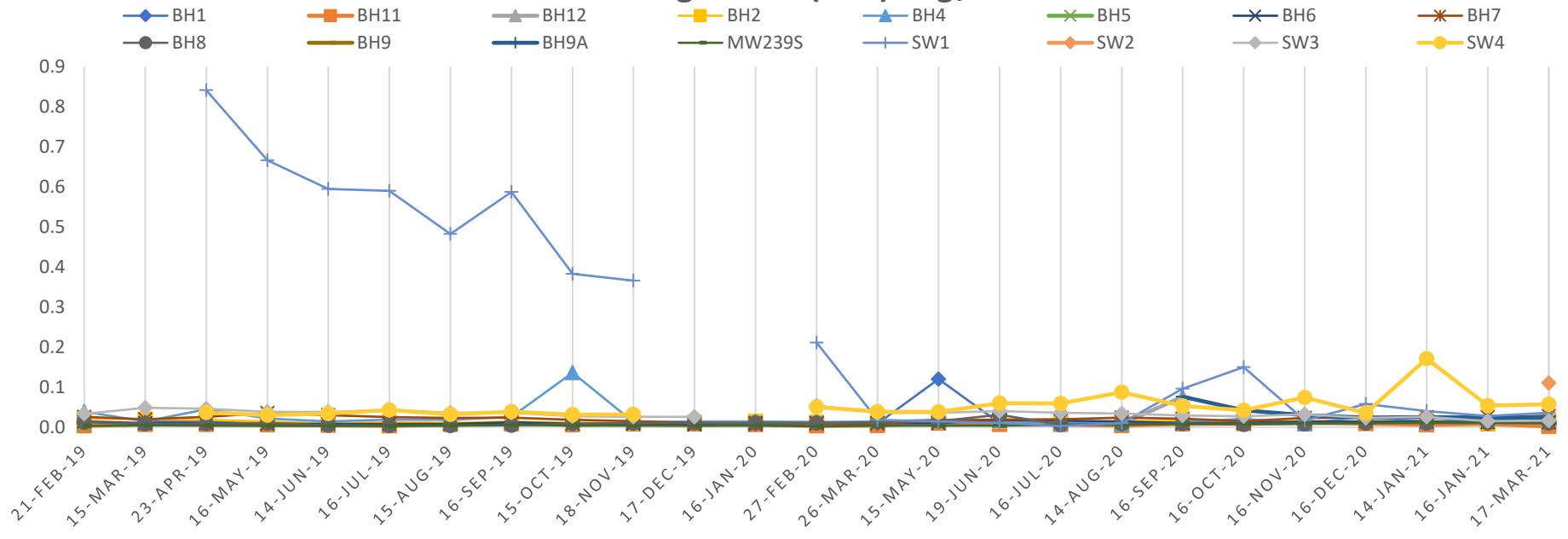




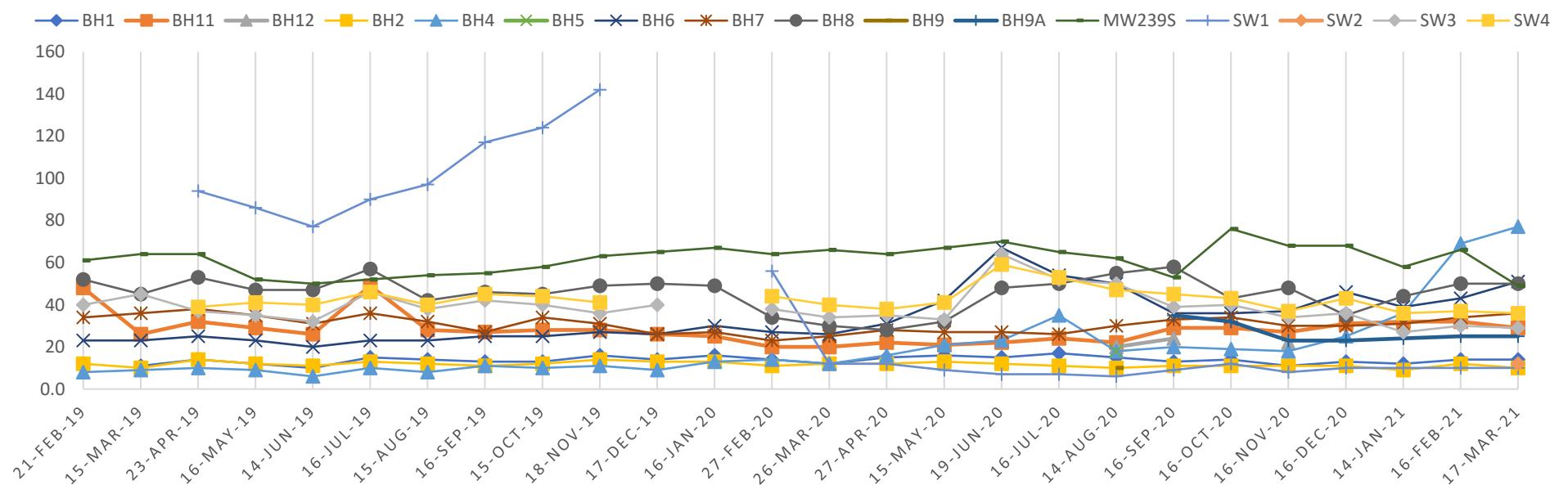


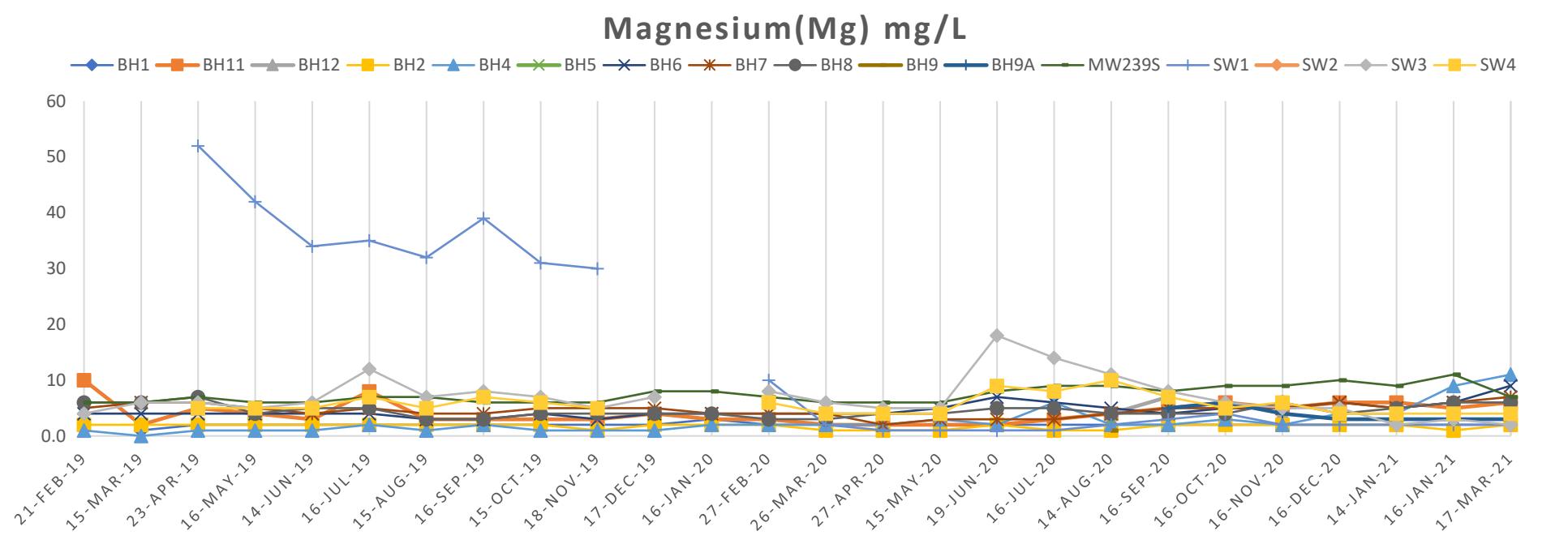
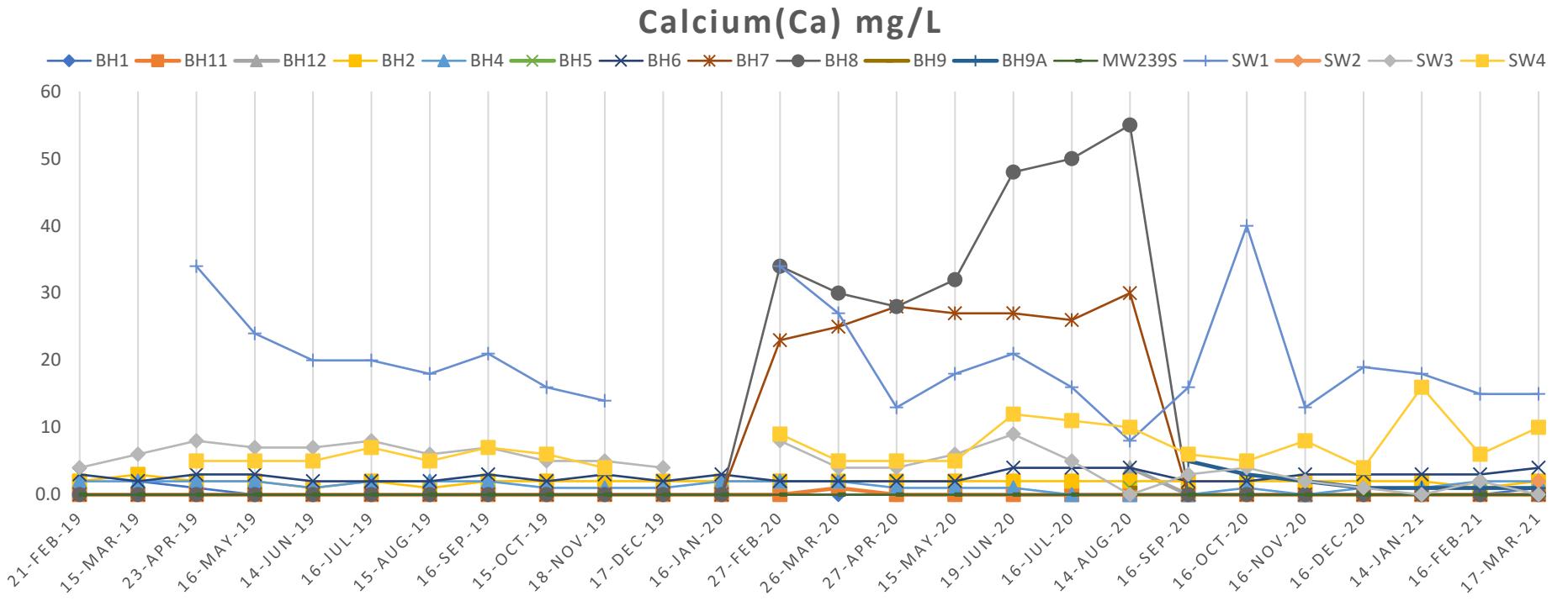


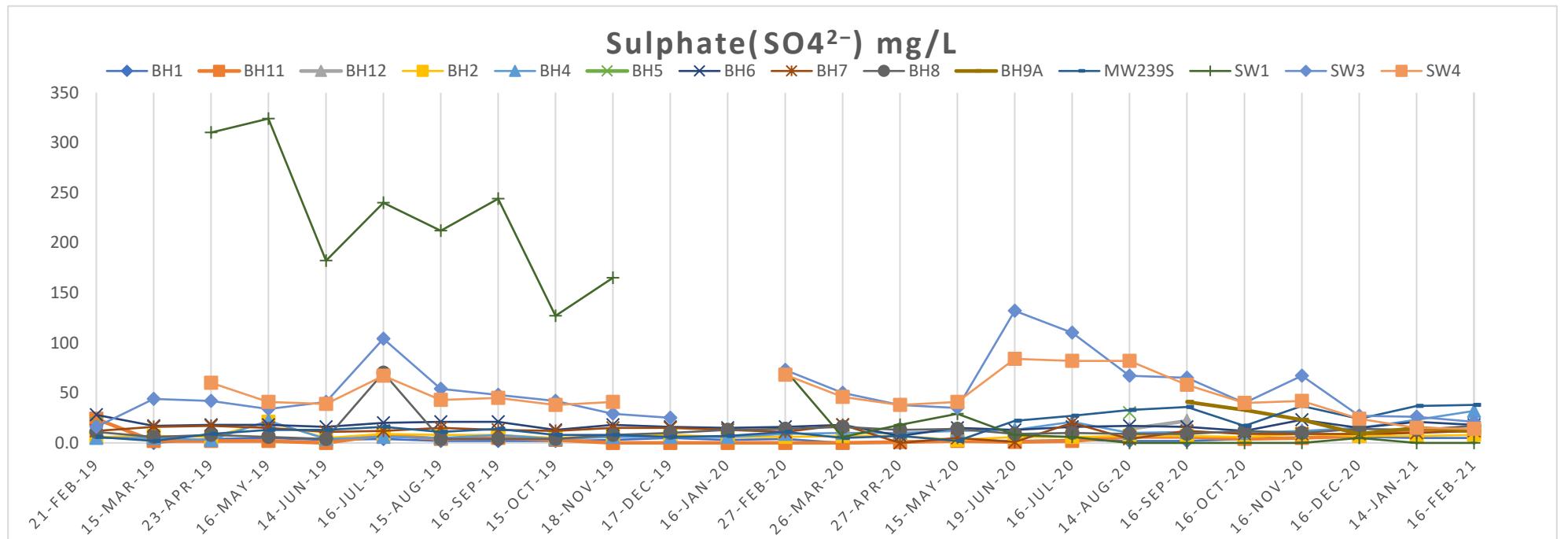
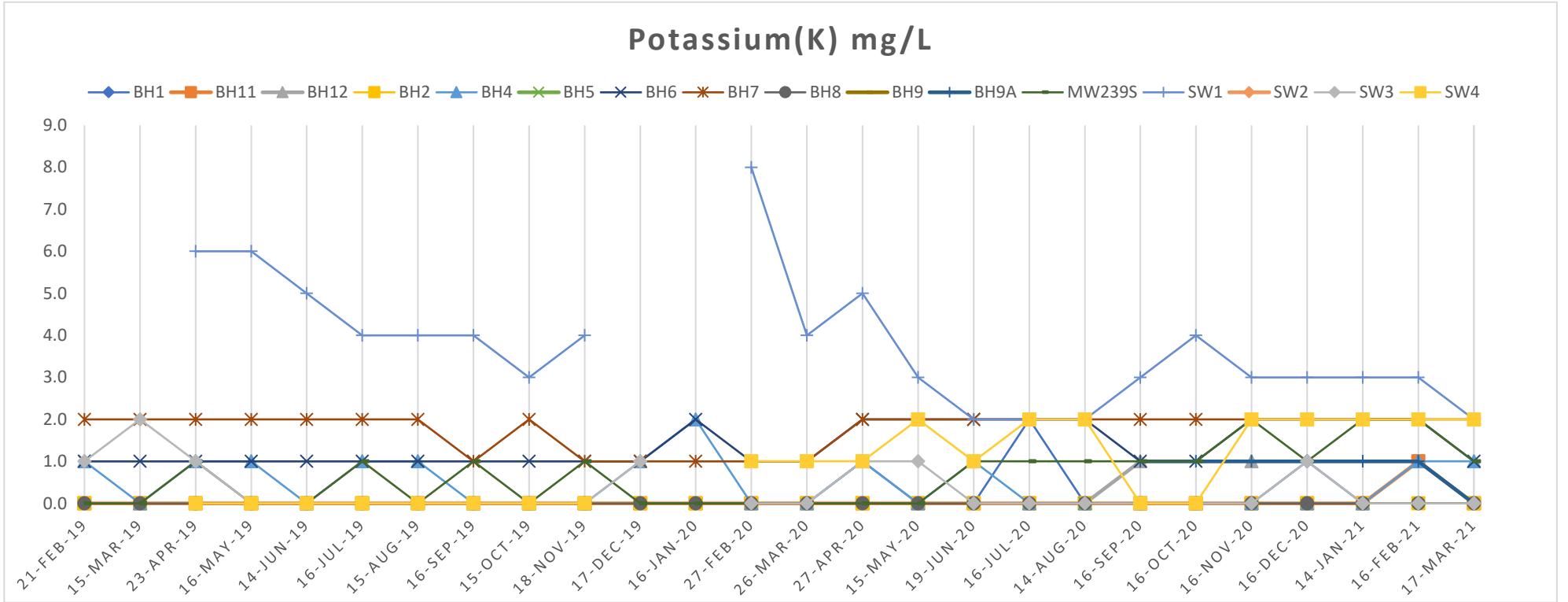
## Manganese (Mn) mg/L



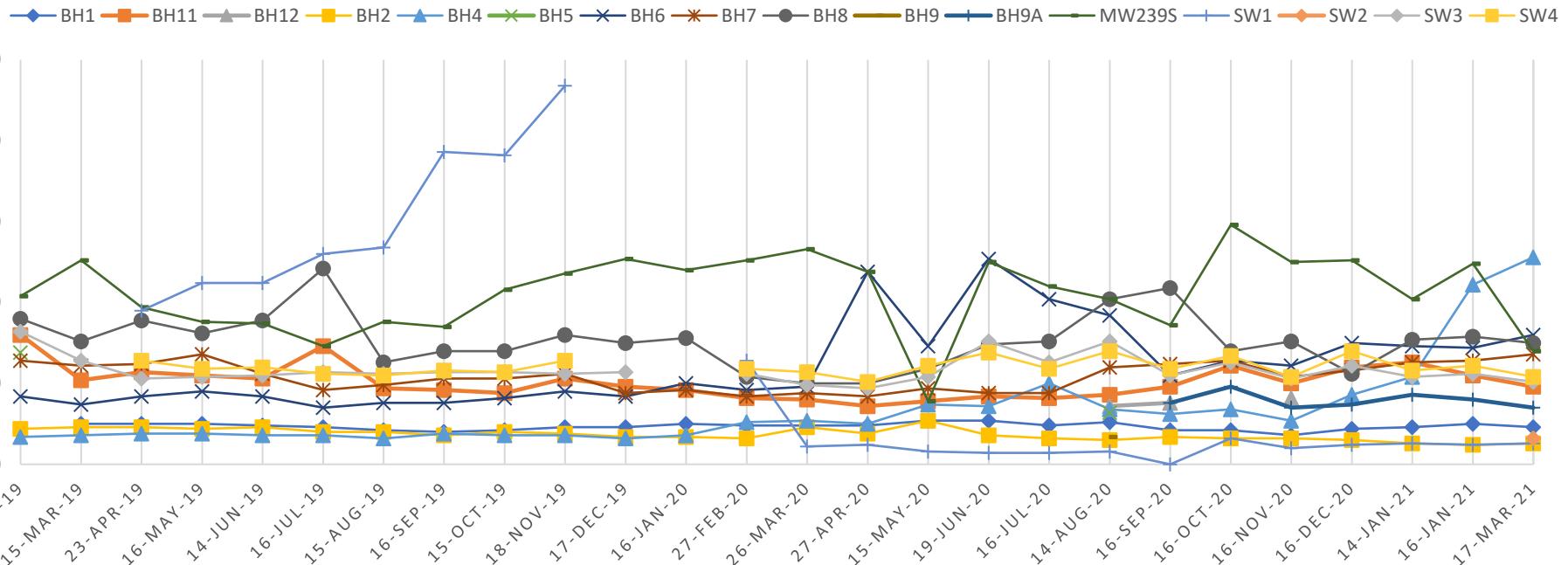
## Sodium(Na) mg/L



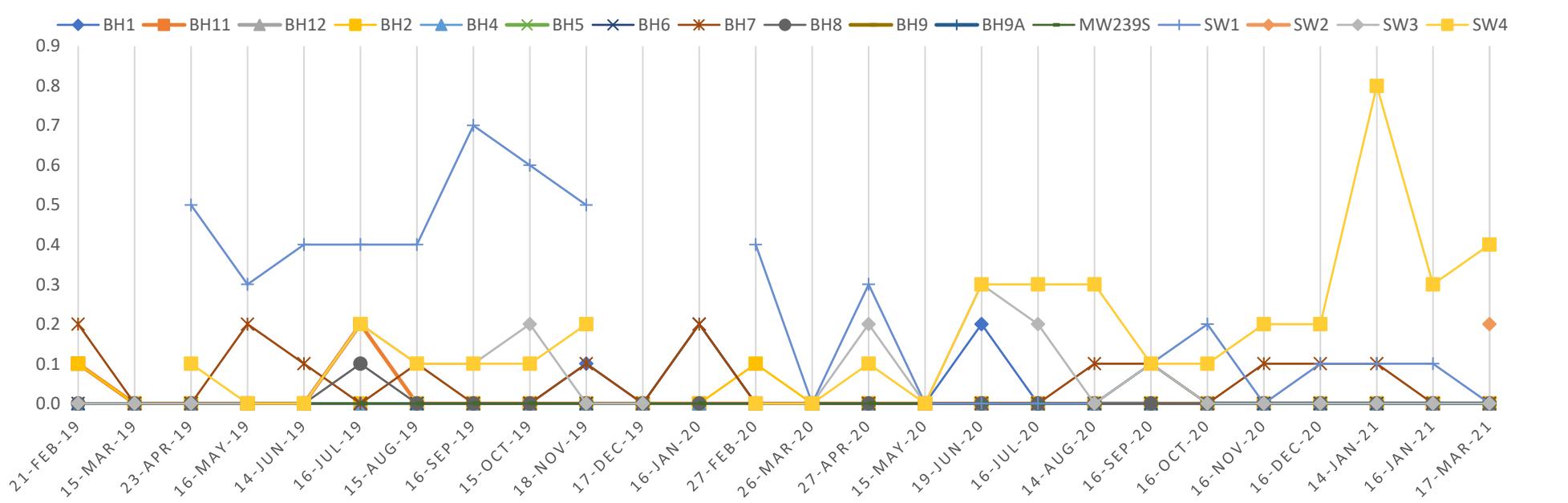


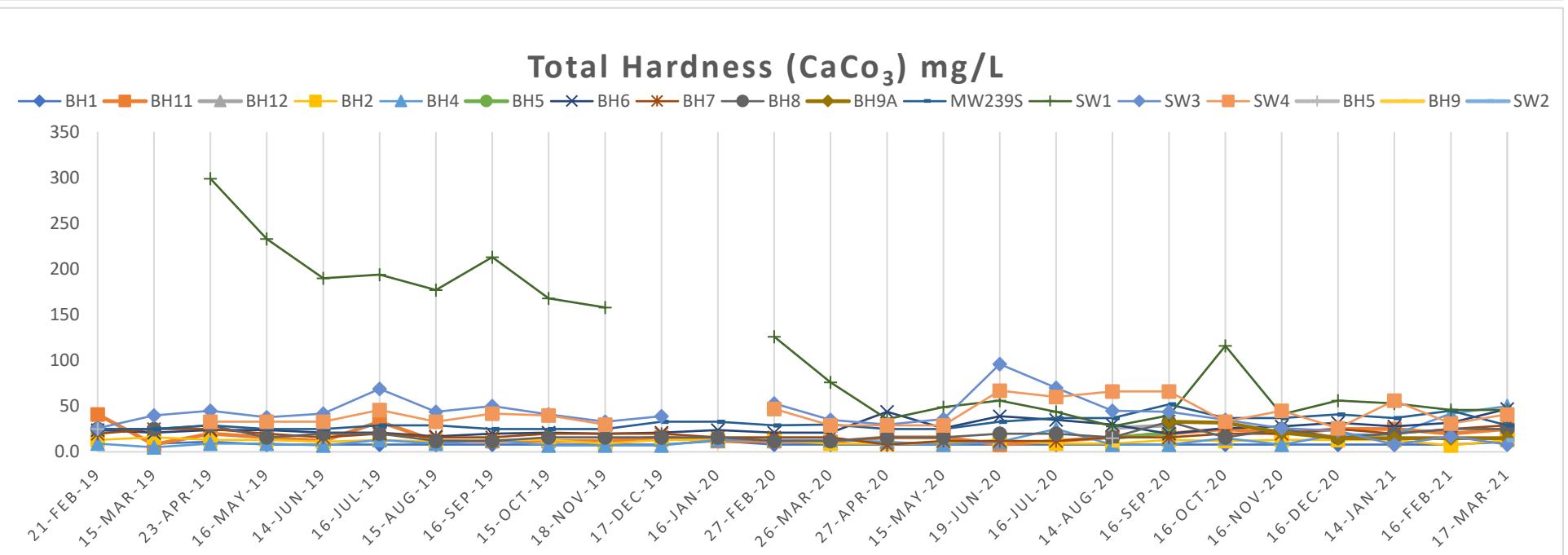
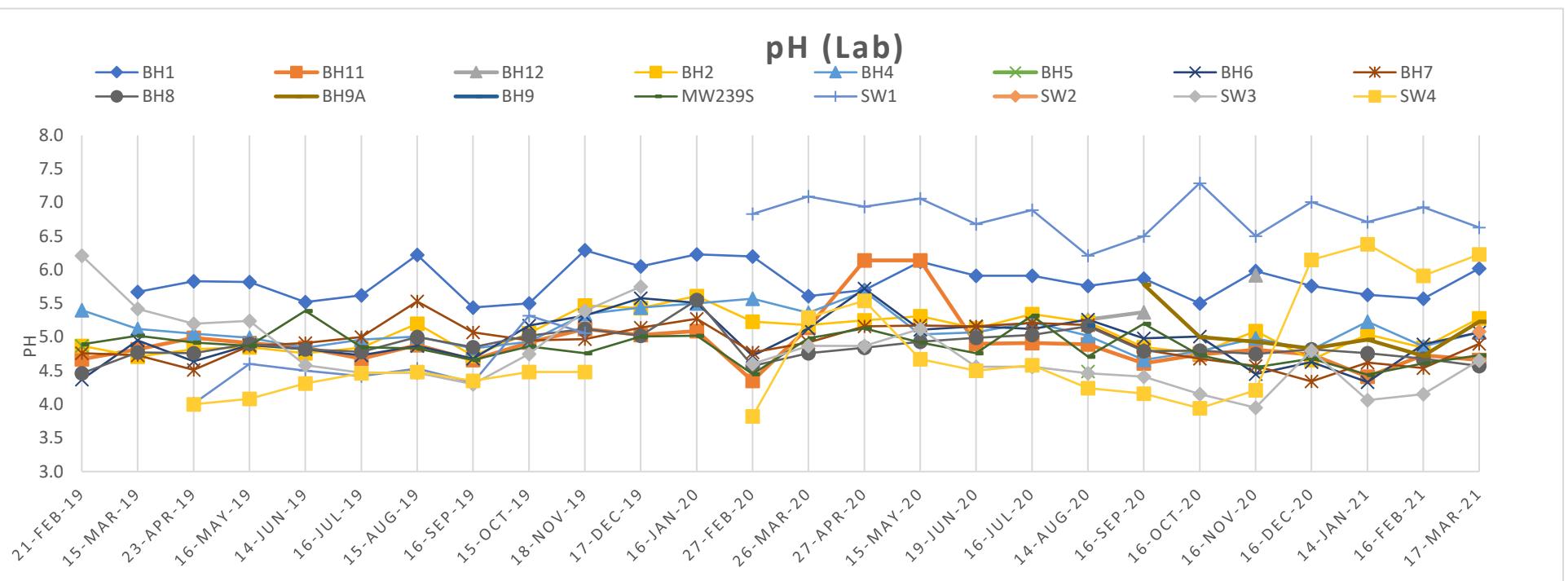


## Chloride (Cl) mg/L

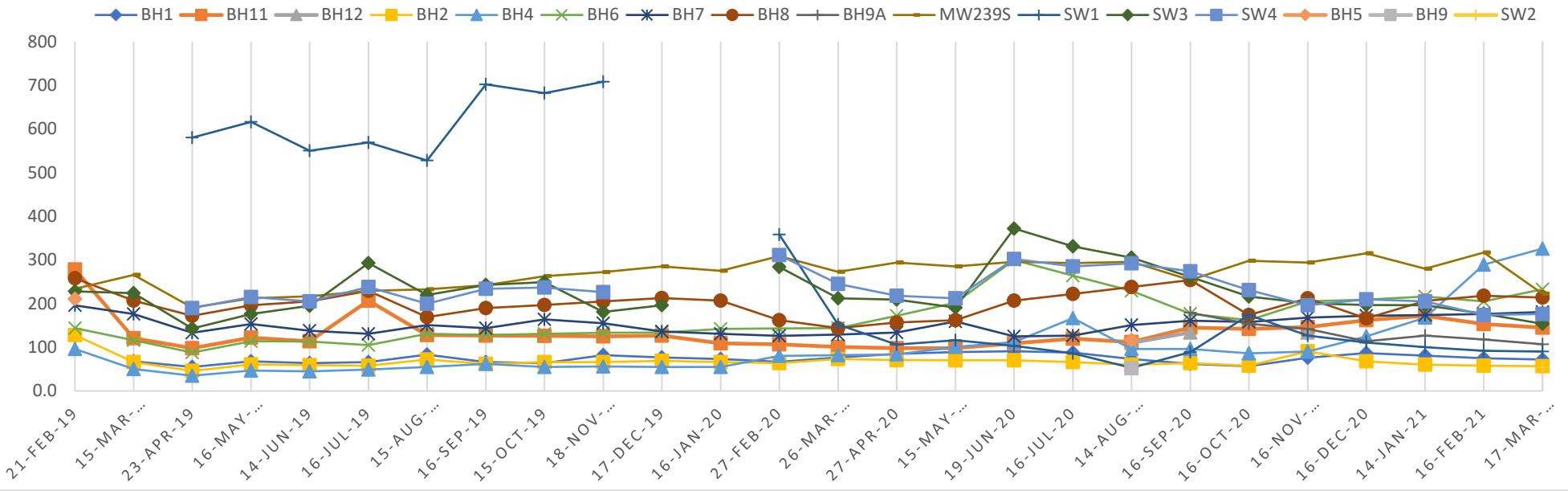


## Fluoride (F<sup>-</sup>) mg/L

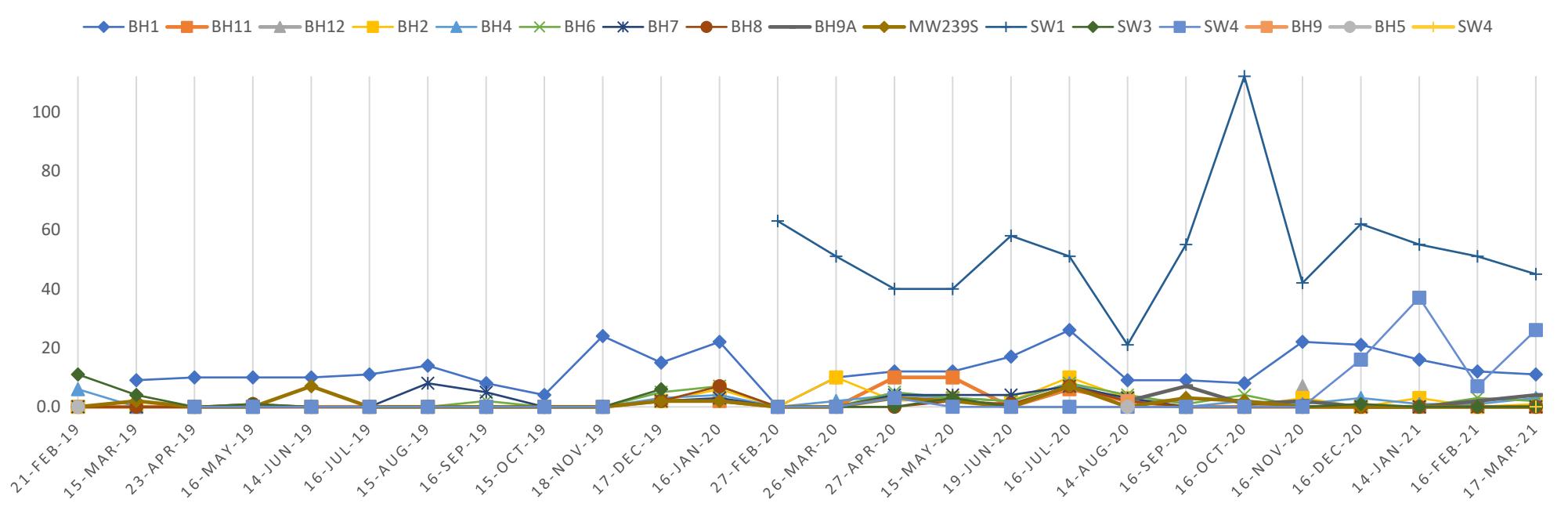


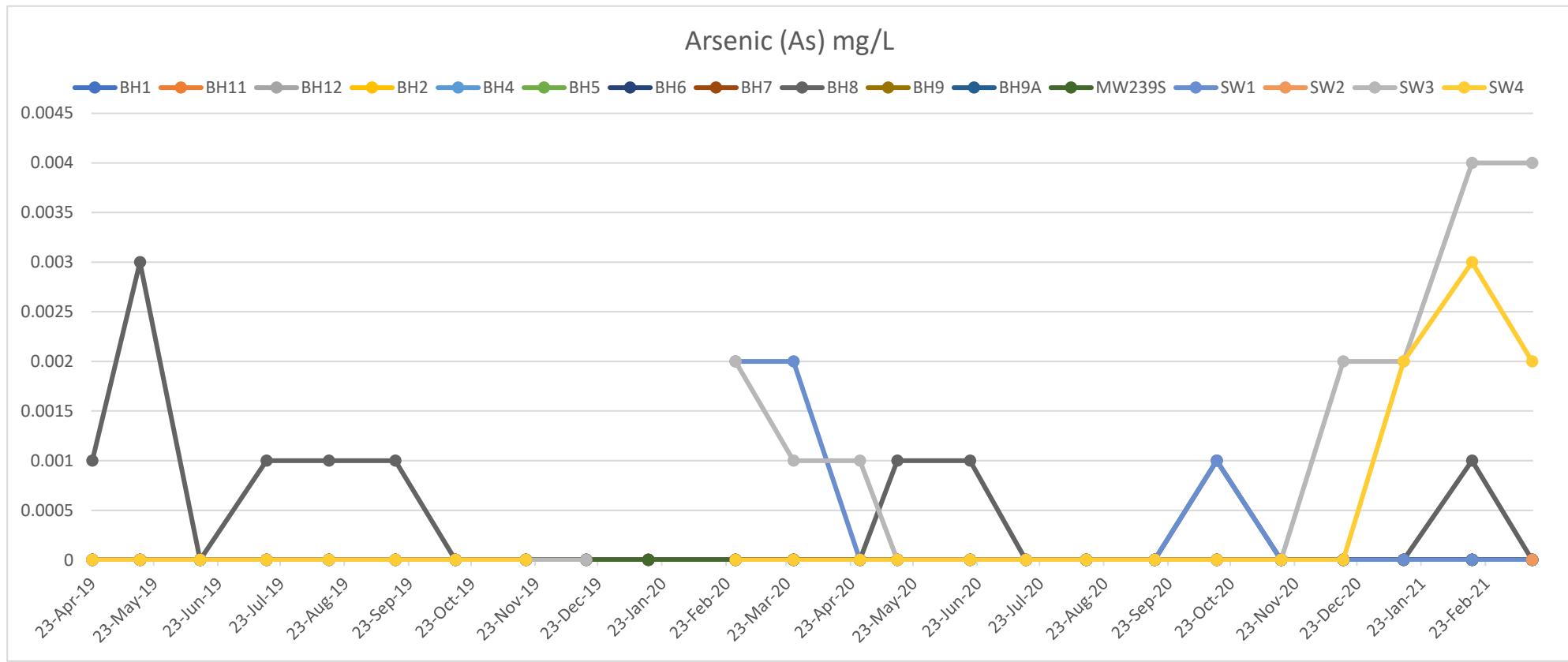


## Total Dissolved Solids (TDS) mg/L



## Total Alkalinity (CaCO<sub>3</sub>) mg/L





**From:** Jonathan Berry  
**To:** Shelbi Mancinelli; shane@newcastlesand.com.au  
**Cc:** Tom Overton; Daniel Kousbroek  
**Subject:** RE: March Water Monitoring Report  
**Date:** Wednesday, 21 April 2021 2:19:00 PM

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Thanks Shelbi,

Appreciate you raising this, we can probably address this in a couple of emails. Simplistically these changes are likely related to the following:

1. Sampling occurred on 17<sup>th</sup>, this followed 50mm from the previous 5 days (before the 341mm over the next 5 days). The level of rainfall immediately before the sampling is not significant (in terms of an event), but would have contributed to groundwater levels. The timing between the sampling and rainfall may have some influence.
2. SW3 and SW4 are both within constructed excavated channels (the other surface water are natural/ not excavated depressions and have no arsenic).
3. Drought and more rainfall has resulted in some remobilisation of natural arsenic and iron compound (e.g. pyrite, that would have normally been underwater and bound/stable). This is also why past RZM mining in the area caused arsenic and iron issues when working in the groundwater table (<https://www.greenleft.org.au/content/battle-preserve-tomago-sand-beds> or perhaps more reputably: <https://s3-ap-southeast-2.amazonaws.com/eis-pdf-records/AB039224.pdf>) and why the quarry needs to stay well above.
4. The change is more likely to be due to groundwater levels increasing than rainfall (albeit obviously related), it would be expected that as groundwater levels increase more oxidised iron and arsenic compounds in the soil adjacent the channel remobilise. They are likely to be restabilise in sediments over a short period.
5. SW3 and SW4 have no direct surface water conduit from the quarry area, SW1 and SW2 are located in areas with an unlikely but possible pathway.
6. I am not aware of any activities onsite that would generate or introduce arsenic to the site (Shane can you please confirm).

Given the above, I don't think this warrants any leaching study for the sands within the quarry area.

Thanks for keeping an eye on these and sending the email, makes it much easier to get the key bits of data quickly.

Cheers  
Jonathan

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**From:** Shelbi Mancinelli <SMancinelli@Kleinfelder.com>  
**Sent:** Wednesday, 21 April 2021 10:13 AM  
**To:** shane@newcastlesand.com.au; Jonathan Berry <jberry@wedgetail.com.au>  
**Cc:** Tom Overton <TOverton@kleinfelder.com>; Daniel Kousbroek <DKousbroek@kleinfelder.com>  
**Subject:** March Water Monitoring Report

Good Morning,

Please see attached the March 2021 monthly water monitoring report.

Please note due to increasing trends observed of arsenic in SW3 and SW4 the following recommendations for further investigation have been provided:

- A review of rainfall data in comparison to other months to understand if an increase in rainfall may be a reason for increased concentrations
- A description of current operations in relation to the location of SW3 along with surface water movements across the site.
- Discussion with current operation staff to understand the work that has been undertaken in the last 4 months to determine for the potential introduction of arsenic sources and / or the potential mobilisation of naturally occurring arsenic due to the quarry operations (a comparison of sand analysis including leachability from the area would help to prove or dis-prove this).

Please don't hesitate to contact Dan, Tom or myself if you wish to discuss.

Regards

**Shelbi-Lee Mancinelli, B.Sc.**

Environmental Scientist – Contaminated Lands

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Charlestown, NSW, 2290

m| 0400 914 623

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