

# Monthly water quality monitoring results

## Cabbage Tree Road sand quarry

### July 2020 monitoring event

NCA20R114397

31 July 2020



Williamtown Sand Syndicate  
PO Box 898  
Newcastle, NSW 2300

**Attention: Darren Williams**

**Subject:** Monthly water quality monitoring results  
Cabbage Tree Road sand quarry  
July 2020 monitoring event

Please find enclosed the monthly water quality monitoring results at Cabbage Tree Road Sand Quarry for the July 2020 monitoring event

## 1 SCOPE OF SERVICE

The scope of work includes the monthly 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 July monitoring was a monthly monitoring event to include gauging of all available monitoring wells (a total of 13 wells) and sampling from ten monitoring wells and four surface water locations.

## 2 SITE WORK

The monthly monitoring round was conducted on 16 July 2020.

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 calculate the volume of water in the well. Following the gauging a HydraSleeve was then placed into the well ensuring the top of the sleeve was located under the water and left in place while all remaining wells were gauged. Following gauging, each of the HydraSleeves were removed and samples taken.

The July 2020 monitoring round included:

- Gauging of 13 monitoring wells;
- Groundwater sampling from eight monitoring wells (BH9 and BH10 were dry); and
- Surface water sampling from three locations (SW2 was dry at the time of sampling).

Water samples were collected in laboratory supplied containers and placed in 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*	11	0	0	1	1
Metals**	11	0	0	1	1
Iron (dissolved)	11	0	0	1	1
Total Dissolved Solids (TDS)	11	0	0	0	0
Total Suspended Solids (TSS)	11	0	0	0	0
PFAS (28 analytes, standard level)	7	0	0	1	1

\* TRH (C6 – C40), BTEXN (Silica Gel)



\*\* NEPM Metals Suite (dissolved) - Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Iron (Fe), Lead (Pb), Manganese (Mn), Mercury (Hg), Zinc (Zn).

### 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**.

**Table 2: Summary of gauging data**

Borehole	Top of Casing (mAHD)	Depth to Water (mBTOC)	Groundwater Elevation (mAHD)	Well Total Depth (mBTOC)	Comment
BH1	8.64	6.958	1.682	8.28	Clear, no odour
BH2	7.79	6.035	1.755	9.03	Light brown, no odour
BH3	-	-	-	-	Well Decommissioned
BH4	3.06	1.470	1.59	6.11	Clear, no odour
BH5	7.36	5.760	1.045	8.8	No sample taken.
BH6	3.62	1.728	1.451	4.62	Light brown, no odour
BH7	2.98	1.430	1.59	4.61	Light brown, no odour.
BH8	3.88	2.020	1.86	6.28	Light brown, no odour
BH9	17.75	Dry	-	16.01	Well was dry.
BH10	6.69	Dry	-	3.58	Well was dry.
BH11	6.63	4.484	2.146	5.39	Light Brown, no odour – bore blocked
BH12	8.67	7.057	1.613	8.2	No sample taken.
MW239S	3.04	1.300	1.74	4.06	Brown, no odour
MW239D	3.04	1.32	1.72	20.32	No sample taken
SW01*	N/A	5.4	-	N/A	Light brown, no odour
SW02*	N/A	Dry	-	N/A	Location was dry – ground damp
SW03*	N/A	3.0	-	N/A	Clear, no odour
SW04*	N/A	4.7	-	N/A	Clear, no odour

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



**Table 3** presents a summary of the water monitoring results that were found to be elevated above criteria adopted in the baseline water quality summary report developed by Kleinfelder (KLF 2020) and a comment comparing results with previous data. Full results tables are provided in the **Attachment 2**. Full Laboratory results, including copies for the COC are provided in **Attachment 3**.

**Attachment 4** provides a graphical representation of trends in data acquired during field sampling and laboratory analysis. Data trends include; monthly rainfall totals versus mean rainfall totals, groundwater elevation (mAHD), field electrical conductivity ( $\mu\text{s}/\text{cm}$ ), concentrations (mg/L) of chromium, copper, iron, nickel, zinc total nitrogen, total hardness, manganese, total phosphorus, total dissolved solids, sodium, calcium, magnesium, potassium, sulphate, chloride and fluoride. Where relevant, the Australian Drinking Water Guideline (Aesthetic values) and ANZECC 2000 Guideline have been included to provide a benchmark for any exceedances recorded.



**Table 3: Water screening levels**

Analyte	Metals					Relative to previous monitoring
	Chromium** <sup>1</sup>	Copper**	Iron	Manganese**	Zinc**	
LOR	0.001	0.001	0.05	0.001	0.005	
Units	mg/L	mg/L	mg/L	mg/L	mg/L	
ANZECC 2000 Trigger Values	0.001	0.0014	-	1.9	0.008	
NHMRC ADWG 6	0.05	2	0.3 <sup>3</sup>	0.5	3 <sup>3</sup>	
Sample Name						
BH1	0.003	0.014	6.22	0.01	0.08	Similar
BH11	0.001	0.001	1	0.007	0.005	Similar
BH2	<0.001	0.029	<0.5	0.012	0.033	Similar
BH4	<0.001	0.069	0.06	0.01	<0.005	Similar
BH6	<0.001	0.002	1.98	0.016	0.036	Similar
BH7	0.003	0.004	1.14	0.02	0.041	Similar
BH8	0.001	0.002	2.87	0.006	<0.005	Similar
MW239S	0.002	0.01	0.55	0.006	0.053	Similar
SW1	<0.001	0.002	<0.5	0.003	<0.005	Similar
SW3	0.001	0.006	1.6	0.036	0.043	Similar
SW4	0.001	0.008	0.8	0.059	0.043	Similar

Notes:

< - Less than laboratory limit of reporting

\*\* 95% Level of protection in freshwater

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

<sup>3</sup> Aesthetic



## 4 RAINWATER DATA

**Table 4** 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. The mean monthly rainfall for the month of June/July indicates that there was below average rainfall leading up to the June 19 sampling event. July rainfall is trending towards average rainfall. Based on current rainfall data (mean and monthly totals) for July 2020 it is expected that surface and groundwater levels will remain stable.

**Table 4: 2020 Rainfall data**

2020	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1st	0	0	0	0	6.4	0	0					
2nd	0	0	0	0.2	0	0	0.2					
3rd	0	0.4	1.4	9.2	0	0.6	0					
4th	0	0.2	6.8	12.4	0	0.2	1.6					
5th	0	0	0.2	4.2	5.6	0	0					
6th	0	0.2	24.6	0	5.6	0	0					
7th	0	25	8.2	0	0.2	0	0					
8th	0.2	28	0.2	0	0	0.4	4					
9th	0.2	66.2	0	0.8	0	26.8	0					
10th	0	16.2	0	0	0	14	0					
11th	0.2	5.6	0.2	4	0	11.4	0.6					
12th	1.4	0.2	1.6	0	0	1.4	1.8					
13th	0.4	1.8	0.2	0	0	0.2	17					
14th	0	3.2	0	0	0.2	11.2	24.6					
15th	0	0	5.8	0	9.2	0	4					
16th	0	0.2	2.6	0	3.4	0	0					
17th	37.4	0.2	0	0	0	0						
18th	21.6	5.8	3.2	0	6.2	4.2						
19th	3.6	4.6	0	0	2.2	0						
20th	0.6	0.2	0	0	0.2	0						
21st	0.2	0	0	0	0.8	0.4						
22nd	0	0	0	0	12	10.2						
23rd	0	0.4	0.6	0	0.2	0.2						
24th	0	0.2	0.6	0	0.2	0						
25th	1	0	0	0	0	0						
26th	0.4	0	21.2	0	38.8	0						
27th	0	13	19.6	17.2	0	0.2						
28th	0	0	0	4.6	0	0						
29th		0	8.4	1	1.6	0						
30th	0	-	0	0	12.6	0.2						



2020	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31st	0	-	0.8	-	0.2	-						
Total	67.2	171.6	106.2	53.6	105.6	70.4	53.8					
Mean	98.3	117.8	120.7	109.8	108.6	124.6	70.3	73.2	60.6	73.5	81.9	77.5

## 5 THANK YOU

The results suggest that since quarry operations began in August 2019 there has been no immediate change in analytical results.

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

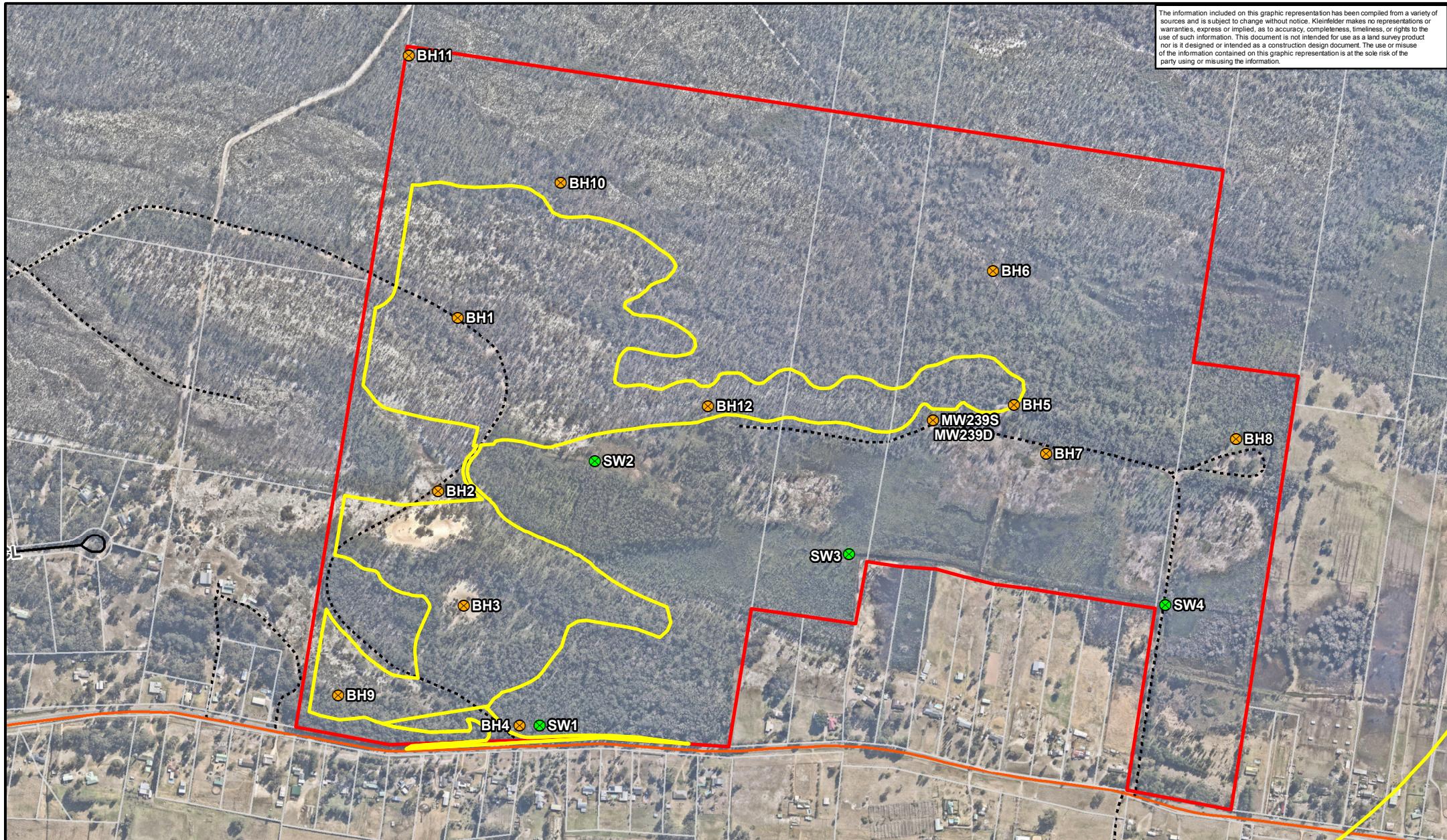
Attachment 1 Figures  
Attachment 2 Results tables and field records  
Attachment 3 Lab results



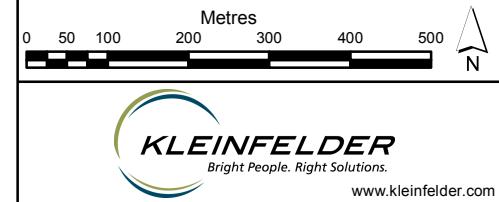
## ATTACHMENT 1 FIGURES



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



Metres  
0 50 100 200 300 400 500  
N  
PROJECT REFERENCE: 20170448  
DATE DRAWN: 13/02/2019 09:48 Version 1  
DRAWN BY: gjoyce  
DATA SOURCE:  
NSW DFSI - 2017  
Nearmap - 2018

## Water monitoring locations February 2019 Monitoring

FIGURE:  
**1**

Williamtown Sand Syndicate  
Proposed Sand Quarry  
Cabbage Tree Road, Williamtown



## ATTACHMENT 2 RESULTS TABLES AND FIELD RECORDS



Table 1  
Groundwater Analytical Data - BTEX  
Willimantic Sand Syndicate

Analyte	BTEX							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**		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>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 (%)	>C <sub>10</sub> -C <sub>16</sub> - Silica Cleanup	F2 - Silica Cleanup	>C <sub>14</sub> -C <sub>16</sub> - Silica Cleanup	>C <sub>28</sub> -C <sub>40</sub> - Silica Cleanup	>C <sub>10</sub> -C <sub>40</sub> - Silica Cleanup	
	1 µg/L	2 µg/L	2 µg/L	2 µg/L	5 µg/L	1 µg/L	20 µg/L		50 µg/L	100 µg/L	50 µg/L	100 µg/L	50 µg/L	20 µg/L	20 µg/L	100 µg/L	100 µg/L	100 µg/L	100 µg/L	100 µg/L	
ANZEC 2000 Trigger Values	950	-	-	-	350	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NHMRC ADWG 6	1	800	300	-	350	600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sample Name	Sample Date																				
BH1	15-Mar-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	1,710	< 50	< 100	< 50	< 50	1,690	1,690	< 100	< 100	< 100	< 100	< 100	< 100
	15-Apr-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	40	< 50	< 100	< 50	< 50	20	20	< 100	< 100	< 100	< 100	< 100	< 100
	16-May-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	14-Jun-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	16-Jul-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	15-Aug-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	15-Sep-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	15-Oct-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	18-Nov-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	17-Dec-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	16-Jan-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	17-Feb-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	26-Mar-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	19-Jun-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	16-Jul-20	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	21-Feb-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	15-Mar-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	15-Apr-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	16-May-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	14-Jun-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	16-Jul-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	15-Aug-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	16-Sep-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	< 50	< 100	< 50	< 50	< 20	< 20	< 100	< 100	< 100	< 100	< 100	< 100
	21-Feb-19	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20												

Table 2  
Groundwater Analytical Data - Metals  
Williamstown Sand Syndicate

Analyte	Metals															
	Arsenic**	Barium	Beryllium	Boron**	Cadmium**	Chromium**	Cobalt	Copper**	Iron	Lead**	Manganese**	Mercury** <sup>a</sup>	Nickel**	Selenium**	Vanadium	Zinc**
LOR	0.001	0.001	0.001	0.05	0.00001	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	
ANZECC 2000 Trigger Values	0.013	-	0.37	0.0002	0.001	-	0.0014	-	0.0014	-	0.0005	0.011	-	-	0.008	
NHMIAC ADWG 6	0.01	-	0.06	4	0.002	0.05	-	2	0.3 <sup>b</sup>	0.01	0.5	0.001	0.02	0.01	-	3 <sup>c</sup>
Sample Name	Sample Date															
BH1	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	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	0.363
	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	0.132
	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	0.074
	16-Jul-19	< 0.001	0.001	< 0.001	< 0.05	< 0.0001	0.003	< 0.001	0.002	7.05	< 0.001	0.1	< 0.0001	0.003	< 0.01	0.16
	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	0.233
	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	0.034
	15-Oct-19	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	0.003	< 0.001	0.005	4.32	< 0.001	0.007	< 0.0001	< 0.001	< 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	0.012
	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	0.028
	16-Jan-20	< 0.001	0.003	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.001	4.43	< 0.001	0.011	< 0.0001	0.002	< 0.01	0.044
	27-Feb-20	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.022	4.10	< 0.001	0.008	< 0.0001	0.004	< 0.01	0.075
	26-Mar-20	< 0.001	0.006	< 0.001	< 0.05	< 0.0001	0.003	< 0.001	0.001	0.02	< 0.001	0.009	< 0.0001	0.005	< 0.01	0.080
	17-Apr-20	< 0.001	-	-	-	-	-	-	0.001	0.001	-	-	-	-	0.035	
	15-May-20	< 0.001	0.006	< 0.001	< 0.05	< 0.0001	0.003	< 0.001	0.013	0.012	< 0.0001	0.006	< 0.0001	< 0.01	< 0.01	0.065
	19-Jun-20	< 0.001	-	-	-	-	-	-	0.006	5.74	< 0.001	0.01	< 0.0001	-	-	0.06
	16-Jul-20	< 0.001	-	-	-	-	-	-	0.014	6.22	< 0.001	0.01	< 0.0001	-	-	0.08
BH11	21-Feb-19	< 0.001	0.008	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.26	< 0.001	0.003	< 0.0001	0.005	< 0.01	< 0.01	0.031
	15-Mar-19	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	1.49	< 0.001	0.007	< 0.0001	0.037	< 0.01	< 0.01	0.016
	23-Apr-19	< 0.001	0.006	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.98	< 0.001	0.007	< 0.0001	0.07	< 0.01	< 0.01	0.04
	16-May-19	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	0.07	< 0.001	0.006	< 0.0001	0.04	< 0.01	< 0.01	0.024
	14-Jun-19	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	0.98	< 0.001	0.005	< 0.0001	0.001	< 0.01	< 0.01	0.005
	16-Jul-19	< 0.001	0.01	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.47	< 0.001	0.003	< 0.0001	0.004	< 0.01	< 0.01	0.007
	15-Aug-19	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.087	< 0.001	0.007	< 0.0001	0.001	< 0.01	< 0.01	0.005
	16-Sep-19	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	0.79	< 0.001	0.008	< 0.0001	0.002	< 0.01	< 0.01	0.012
	15-Oct-19	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.74	< 0.001	0.006	< 0.0001	0.003	< 0.01	< 0.01	0.016
	18-Nov-19	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.95	< 0.001	0.008	< 0.0001	0.002	< 0.01	< 0.01	0.006
	17-Dec-19	< 0.001	0.005	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	1.08	< 0.001	0.007	< 0.0001	0.003	< 0.01	< 0.01	0.005
	16-Jan-20	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.60	< 0.001	0.003	< 0.0001	0.002	< 0.01	< 0.01	0.027
	27-Feb-20	< 0.001	0.004	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.001	0.36	< 0.001	0.004	< 0.0001	0.006	< 0.01	0.038
	26-Mar-20	< 0.001	0.007	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	0.001	0.22	< 0.001	-	< 0.0001	< 0.01	< 0.01	0.035
	27-Apr-20	< 0.001	-	-	-	-	-	-	0.002	0.22	< 0.001	-	< 0.0001	-	-	
	15-May-20	< 0.001	0.008	< 0.001	< 0.05	< 0.0001	0.002	< 0.001	0.009	-	< 0.001	0.01	< 0.0001	0.007	< 0.01	0.025
	19-Jun-20	< 0.001	-	-	-	-	-	-	0.003	0.72	< 0.001	-	< 0.0001	-	-	
	16-Jul-20	< 0.001	-	-	-	-	-	-	0.029	0.5	< 0.001	0.012	< 0.0001	-	-	
BH11																



Analyte	Perfluoroalkyl Sulfonamides							(n:2) Fluorotelomer Sulfonic Acids			Sum of PFAS			
	Perfluorooctane sulfonamide (FOA)	N-Methyl-perfluorooctane sulfonamide (MeFOA)	N-Ethyl perfluorooctane sulfonamide (EtFOA)	N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSSAA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSSAA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	Sum of PFAS (WA DER List)	Sum of PFAS
LOR	0.02	0.05	0.05	0.05	0.05	0.02	0.02	0.05	0.05	0.05	0.05	0.01	0.01	0.01
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
NHMPC ADWG-6														
HEPA NEMP 2018***														
HEPA NEMP 2018*														
Sample Name	Sample Date													
BH1	21-Feb-19	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
BH2	22-Feb-19	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
BH3	21-Feb-19	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
BH4	21-Feb-19	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	15-Mar-19	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	23-Apr-19	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	16-May-19	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	14-Jun-19	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	16-Jul-19	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	15-Aug-19	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	25-Sep-19	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<b>0.02</b>
	15-Oct-19	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	18-Nov-19	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	17-Dec-19	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	16-Jan-20	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	27-Feb-20	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	26-Mar-20	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	27-Apr-20	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	15-May-20	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	19-Jun-20	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	16-Jul-20	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
BH5	22-Feb-19	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
BH6	22-Feb-19	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	14-Mar-19	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	23-Apr-19	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	16-May-19	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	14-Jun-19	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	16-Jul-19	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	15-Aug-19	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	16-Sep-19	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	18-Nov-19	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	17-Dec-19	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<b>0.01</b>
	16-Jan-20	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	27-Feb-20	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	26-Mar-20	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	27-Apr-20	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
	15-May-20	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	&				

Table 4  
Groundwater Analytical Data - Inorganics  
Willitownt Sand Syndicate

Analyte	Anions and Cations															
	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	
LOR	1	1	1	1	1	1	0.1	0.01	0.01	0.01	0.01	0.01	0.01	0.1	0.1	
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	
ANZECC 2000 Trigger Values								0.02*	0.025*	0.07**	0.9**	0.35*				
NHMRC ADWG Values	180 <sup>3</sup>				250 <sup>3</sup>	250 <sup>3</sup>	1.5			3	50	50				
Sample Name	Sampling Date															
BH1	15-May-19	11	2.0	1.0	<1.0	<1.0	25	<0.1	-	-	-	-	-	-	-	
	23-Apr-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	0.3	
	16-May-19	12	<1.0	2.0	<1.0	5.0	25	<0.1	-	-	-	-	-	-	-	
	14-Jun-19	10	<1.0	2.0	<1.0	3.0	24	<0.1	-	-	-	-	-	-	-	
	16-Jul-19	15	<1.0	2.0	<1.0	4.0	23	<0.1	-	-	-	-	-	-	-	
	15-Aug-19	14	<1.0	2.0	<1.0	2.0	21	<0.1	-	-	-	-	-	-	-	
	16-Sep-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	0.3	
	15-Oct-19	13	<1.0	2.0	<1.0	2.0	21	<0.1	-	-	-	-	-	-	-	
	18-Nov-19	16	<1.0	2.0	<1.0	3.0	23	<0.1	<0.01	<0.01	0.01	0.01	0.13	0.3	0.3	
	17-Dec-19	14	<1	2	<1	5	23	<0.1	-	-	-	-	-	-	-	
	16-Jan-20	16	<1	3	<1	3	25	<0.1	-	-	-	-	-	-	-	
	17-Feb-20	14	<1	2	<1	4	24	<0.1	<0.01	0.02	<0.01	0.02	0.22	0.4	0.4	
	26-Mar-20	12	<1	2	<1	1	24	<0.1	-	-	-	-	-	-	-	
	27-Apr-20	15	<1	2	<1	1	24	<0.1	-	-	-	-	-	-	-	
	15-May-20	16	<1	2	<1	3	27	<0.1	<0.01	0.06	<0.01	0.04	0.04	0.1	1	
	19-Jun-20	15	<1	2	<1	2	27	0.2	-	-	-	-	-	-	-	
	16-Jul-20	17	<1	2	<1	3	24	<0.1	-	-	-	-	-	-	-	
BH11	15-Mar-19	40	<1.0	10	<1.0	24	60	0.3	<0.01	0.03	<0.01	0.04	0.04	0.06	1.8	1.8
	15-May-19	76	<1.0	2.0	<1.0	2.0	52	<0.1	-	-	-	-	-	-	-	-
	23-Apr-19	32	<1.0	5.0	<1.0	2.0	57	<0.1	-	-	-	-	-	-	-	-
	16-May-19	29	<1.0	4.0	<1.0	2.0	55	<0.1	<0.01	0.01	<0.01	<0.01	0.12	0.4	0.4	
	14-Jun-19	26	<1.0	3.0	<1.0	1.0	53	<0.1	-	-	-	-	-	-	-	-
	16-Jul-19	49	<1.0	8.0	<1.0	8.0	73	<0.1	-	-	-	-	-	-	-	-
	15-Aug-19	28	<1.0	5.0	<1.0	4.0	47	<0.1	-	-	-	-	-	-	-	-
	16-Sep-19	27	<1.0	3.0	<1.0	5.0	46	<0.1	<0.01	0.12	<0.01	<0.01	0.15	0.7	0.7	
	15-Oct-19	28	<1.0	3.0	<1.0	3.0	44	<0.1	-	-	-	-	-	-	-	-
	18-Nov-19	28	<1.0	3.0	<1.0	1.0	53	<0.1	<0.01	2.11	<0.01	0.06	0.06	0.18	5.9	5.8
	17-Dec-19	26	<1	4	<1	<1	48	<0.1	-	-	-	-	-	-	-	-
BH2	15-Mar-19	40	<1.0	10	<1.0	24	60	0.3	<0.01	0.03	<0.01	0.04	0.04	0.06	1.8	1.8
	15-May-19	76	<1.0	2.0	<1.0	2.0	52	<0.1	-	-	-	-	-	-	-	-
	23-Apr-19	32	<1.0	5.0	<1.0	2.0	57	<0.1	-	-	-	-	-	-	-	-
	16-May-19	29	<1.0	4.0	<1.0	2.0	55	<0.1	<0.01	0.01	<0.01	<0.01	0.12	0.4	0.4	
	14-Jun-19	26	<1.0	3.0	<1.0	1.0	53	<0.1	-	-	-	-	-	-	-	-
	16-Jul-19	49	<1.0	8.0	<1.0	8.0	73	<0.1	-	-	-	-	-	-	-	-
	15-Aug-19	28	<1.0	5.0	<1.0	4.0	46	<0.1	-	-	-	-	-	-	-	-
	16-Sep-19	27	<1.0	3.0	<1.0	5.0	44	<0.1	<0.01	0.28	<0.01	1.07	1.07	0.04	2.7	1.6
	15-Oct-19	28	<1.0	3.0	<1.0	5.0	20	<0.1	-	-	-	-	-	-	-	-
	18-Nov-19	28	<1.0	3.0	<1.0	1.0	19	<0.1	<0.01	0.21	<0.01	0.21	0.21	0.72	85.5	85.3
	17-Dec-19	26	<1	4	<1	<1	48	<0.1	-	-	-	-	-	-	-	-
BH3	15-Mar-19	40	<1.0	10	<1.0	24	60	0.3	<0.01	0.03	<0.01	0.04	0.04	0.06	1.8	1.8
	15-May-19	76	<1.0	2.0	<1.0	2.0	52	<0.1	-	-	-	-	-	-	-	-
	23-Apr-19	32	<1.0	5.0	<1.0	2.0	57	<0.1	-	-	-	-	-	-	-	-
	16-May-19	29	<1.0	4.0	<1.0	2.0	55	<0.1	<0.01	0.01	<0.01	<0.01	0.12	0.4	0.4	
	14-Jun-19	26	<1.0	3.0	<1.0	1.0	53	<0.1	-	-	-	-	-	-	-	-
	16-Jul-19	49	<1.0	8.0	<1.0	8.0	73	<0.1	-	-	-	-	-	-	-	-
	15-Aug-19	28	<1.0	5.0	<1.0	4.0	44	<0.1	<0.01	0.28	<0.01	1.07	1.07	0.04	2.7	1.6
	16-Sep-19	27	<1.0	3.0	<1.0	5.0	20	<0.1	-	-	-	-	-	-	-	-
	15-Oct-19	28	<1.0	3.0	<1.0	5.0	18	<0.1	<0.01	0.21	<0.01	0.21	0.21	0.72	85.5	85.3
	18-Nov-19	14	<1.0	1.0	<1.0	7.0	19	<0.1	<0.01	0.21	<0.01	0.21	0.21	0.72	85.5	85.3
	17-Dec-19	13	<1	2	<1	8	17	<0.1	-	-	-	-	-	-	-	-
BH4	22-Feb-19	12	2.0	2.0	<1.0	6.										



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-Xylenes	ortho-Xylene	Total Xylenes	Naphthalene	Sum of BTEX	C <sub>6</sub> - C <sub>9</sub>	C <sub>10</sub> - C <sub>14</sub>	C <sub>15</sub> - C <sub>28</sub>	C <sub>29</sub> - C <sub>36</sub>	C <sub>10</sub> - C <sub>36</sub> sum	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> 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>	>C <sub>10</sub> - C <sub>16</sub> minus Naphthalene (F2)	>C <sub>10</sub> - C <sub>34</sub>	>C <sub>10</sub> - C <sub>40</sub>	>C <sub>10</sub> -C <sub>14</sub> - Silica Cleanup	F2 - Silica Cleanup	>C <sub>14</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			
Sample Name	Sample Date	Sample Type																												
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L			
TRIP BLANK_13022019	13-Feb-19	Trip Blank	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	-	-	-	< 50	< 100	< 50	< 20	< 20	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100			
RINSTATE01_21022019	21-Feb-19	Rinsate	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	-	-	-	< 50	< 100	< 50	< 20	< 20	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100			
RHR_21022019	21-Feb-19	Primary	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	-	-	-	< 50	< 100	< 50	< 20	< 20	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100			
DUP01_21022019	21-Feb-19	Duplicate	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	-	-	-	< 50	< 100	< 50	< 20	< 20	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100			
Relative Percentage Difference		NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC			
BH8_21022019	21-Feb-19	Primary	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	-	-	-	< 50	< 100	< 50	< 20	< 20	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100			
TRIP01_21022019	21-Feb-19	Triuplicate	< 1.0	< 1.0	< 2.0	< 2.0	< 1.0	< 3.0	< 10	-	< 20	< 50	< 100	< 100	< 50	< 100	< 20	< 20	< 50	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100			
Relative Percentage Difference		NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC				
TRIP BLANK_130319	13-Mar-19	Trip Blank	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	-	-	-	< 50	< 100	< 50	< 20	< 20	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100			
RINSTATE02_140319	14-Mar-19	Rinsate	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	-	-	-	< 50	< 100	< 50	< 20	< 20	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100			
BHT_140319	14-Mar-19	Primary	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	-	-	-	< 50	< 100	< 50	< 20	< 20	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100			
DUP02_140319	14-Mar-19	Duplicate	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	-	-	-	< 50	< 100	< 50	< 20	< 20	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100			
Relative Percentage Difference		NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC					
TRIP BLANK_130419	13-Apr-19	Trip Blank	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	-	-	-	< 50	< 100	< 50	< 20	< 20	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100			
RINSTATE03_140419	14-Apr-19	Rinsate	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	-	-	-	< 50	< 100	< 50	< 20	< 20	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100			
TRIP BLANK_140419	14-Apr-19	Trip Blank	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	-	-	-	< 50	< 100	< 50	< 20	< 20	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100			
Relative Percentage Difference		NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC						
RINSTATE04_140419	14-Jun-19	Rinsate	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	-	-	-	< 50	< 100	< 50	< 20	< 20	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100			
TRIP BLANK_140419	14-Jun-19	Trip Blank	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	-	-	-	< 50	< 100	< 50	< 20	< 20	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100			
Relative Percentage Difference		NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC						
RINSTATE05_140419	14-Jun-19	Rinsate	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.0	< 1.0	< 20	-	-	-	< 50	< 100	< 50	< 20	< 20	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100			
TRIP05_140419	14-Jun-19	Triuplicate	< 1.0	< 1.0	< 2.0	< 2.0	< 1.0	< 3.0	< 10																					

Table 6  
Quality Control Sample Analysis - Metals  
Williamstown Sand Syndicate



Analyte			Metals															
			Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Vanadium	Zinc
Sample Name	Sample Date	Sample Type	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
TRIP-BLANK_13022019	13-Feb-19	Trip Blank	< 0.001	< 0.001	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	< 0.05	< 0.001	< 0.001	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005	
RINSTATE01_21022019	21-Feb-19	Rinsate	< 0.001	< 0.001	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	< 0.05	< 0.001	< 0.001	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005	
BH8_21022019	21-Feb-19	Primary	< 0.001	0.011	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	4.1	< 0.001	0.012	< 0.0001	0.002	< 0.01	< 0.01	0.005	
DUP01_21022019	21-Feb-19	Duplicate	0.001	0.014	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	4.09	< 0.001	0.012	< 0.0001	0.003	< 0.01	< 0.01	0.015	
Relative Percentage Difference			<b>67%</b>	24%	NC	NC	0%	NC	0%	NC	0%	NC	40%	NC	NC	NC	<b>100%</b>	
BH8_21022019	21-Feb-19	Primary	< 0.001	0.011	< 0.001	< 0.05	< 0.0001	0.001	< 0.001	4.1	< 0.001	0.012	< 0.0001	0.002	< 0.01	< 0.01	0.005	
TRIP01_21022019	21-Feb-19	Triplicate	0.001	< 0.02	< 0.001	< 0.05	< 0.0002	< 0.005	< 0.001	< 0.001	4.5	< 0.001	0.012	< 0.0001	0.003	-	< 0.005	0.006
Relative Percentage Difference			<b>67%</b>	10%	NC	NC	<b>86%</b>	NC	9%	NC	0%	NC	40%	NC	NC	18%		
TRIP-BLANK_130319	13-Mar-19	Trip Blank	< 0.001	< 0.001	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005	
RINSTATE02_140319	14-Mar-19	Rinsate	< 0.001	< 0.001	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	< 0.05	< 0.001	< 0.001	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005	
BH7_140319	14-Mar-19	Primary	< 0.001	0.01	< 0.001	< 0.05	< 0.0001	0.001	0.003	1.8	< 0.001	0.02	< 0.0001	0.004	< 0.01	< 0.01	0.009	
DUP02_140319	14-Mar-19	Duplicate	< 0.001	0.01	< 0.001	< 0.05	< 0.0001	0.001	0.002	< 0.001	2.51	< 0.001	0.021	< 0.0001	0.004	< 0.01	< 0.01	0.007
Relative Percentage Difference			NC	0%	NC	NC	0%	<b>40%</b>	NC	33%	NC	5%	NC	0%	NC	NC	25%	
BH7_140319	14-Mar-19	Primary	< 0.001	0.01	< 0.001	< 0.05	< 0.0001	0.001	0.003	1.8	< 0.001	0.02	< 0.0001	0.004	< 0.01	< 0.01	0.009	
TRIP02_140319	14-Mar-19	Triplicate	< 0.001	< 0.02	< 0.001	< 0.05	< 0.0002	0.001	0.002	< 0.001	1.7	< 0.001	0.019	< 0.0001	< 0.001	-	< 0.005	< 0.005
Relative Percentage Difference			NC	0%	NC	NC	0%	<b>40%</b>	NC	6%	NC	5%	NC	<b>156%</b>	NC	NC	<b>113%</b>	
TRIP-BLANK_03	23-Apr-19	Trip Blank	< 0.001	< 0.001	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	< 0.05	< 0.001	< 0.001	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005	
RINSTATE_03	23-Apr-19	Rinsate	< 0.001	< 0.001	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	< 0.05	< 0.001	< 0.001	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005	
TRIP-BLANK_04	16-May-19	Trip Blank	< 0.001	< 0.001	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	< 0.05	< 0.001	< 0.001	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005	
RINSTATE_04	16-May-19	Rinsate	< 0.001	< 0.001	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	< 0.05	< 0.001	< 0.001	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005	
TRIP-BLANK_05	14-Jun-19	Trip Blank	< 0.001	< 0.001	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	< 0.05	< 0.001	< 0.001	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005	
RINSTATE_05	14-Jun-19	Rinsate	< 0.001	< 0.001	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	< 0.05	< 0.001	< 0.001	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005	
SW3_14062019	14-Jun-19	Primary	< 0.001	0.035	< 0.001	< 0.05	< 0.0001	< 0.001	0.003	1.68	< 0.001	0.038	< 0.0001	0.003	< 0.01	< 0.01	0.016	
DUP05_14062019	14-Jun-19	Duplicate	< 0.001	0.036	< 0.001	< 0.05	< 0.0001	< 0.001	0.003	1.63	< 0.001	0.039	< 0.0001	0.003	< 0.01	< 0.01	0.013	
Relative Percentage Difference			NC	3%	NC	NC	0%	<b>9%</b>	NC	3%	NC	3%	NC	<b>0%</b>	NC	NC	21%	
SW3_14062019	14-Jun-19	Primary	< 0.001	0.035	< 0.001	< 0.05	< 0.0001	< 0.001	0.003	< 0.001	1.68	< 0.001	0.038	< 0.0001	0.003	< 0.01	< 0.01	0.016
TRIP05_14062019	14-Jun-19	Triplicate	< 0.001	0.04	< 0.001	< 0.05	< 0.0002	< 0.001	0.002	< 0.001	0.69	< 0.001	0.037	< 0.0001	0.003	-	< 0.005	0.012
Relative Percentage Difference			NC	14%	NC	NC	0%	<b>190%</b>	NC	8%	NC	<b>67%</b>	NC	<b>140%</b>	NC	NC	<b>151%</b>	
SW4_16092019	16-Sep-19	Primary	< 0.001	0.046	< 0.001	< 0.05	< 0.0001	< 0.001	0.002	0.2	0.7	0.001	0.039	< 0.0001	0.003	< 0.01	< 0.01	0.085
TRIP08_16092019	16-Sep-19	Triplicate	< 0.001	0.04	< 0.001	< 0.05	< 0.0002	< 0.001	0.002	< 0.001	0.69	< 0.001	0.037	< 0.0001	0.003	-	< 0.005	0.012
Relative Percentage Difference			NC	14%	NC	NC	0%	<b>190%</b>	NC	5%	NC	<b>67%</b>	NC	<b>140%</b>	NC	NC	<b>151%</b>	
TRIP-BLANK_15102019	15-Oct-19	Trip Blank	< 0.001	< 0.001	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	< 0.05	< 0.001	< 0.001	< 0.0001	< 0.001	< 0.01	< 0.01	< 0.005	
RINSTATE_15102019	15-Oct-19	Rinsate	< 0.001	< 0.001	< 0.001	< 0.05	< 0.0001	< 0.001	< 0.001	< 0.05	< 0.001	< 0.001	< 0.0001	< 0.001	< 0.01	< 0.01	<	

Table 7  
Quality Control Sample Analysis - PFAs  
Williamtown Sand Syndicate



**Notes:**  
< - Less than laboratory limit of reporting  
NC - Not calculated

Table 7  
Quality Control Sample Analysis - PFAS  
Williamstown Sand Syndicate



Analyte			Perfluoroalkyl Sulfonamides							(n:2) Fluorotelomer Sulfonic Acids				Sum of PFAS		
			Perfluorooctane sulfonamide (FOSA)	N-Methyl-perfluorooctane sulfonamide (MeFOSA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamidoethanol (MeFOSEA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSEA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSSAA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSSAA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	Sum of PFAS (WA DER List)	Sum of PFAS
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
Sample Name	Sample Date	Sample Type														
TRIP BLANK_13022019	13-Feb-19	Trip Blank	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
RINSTATE01_21022019	21-Feb-19	Rinsate	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
BH8_21022019	21-Feb-19	Primary	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
DUP01_21022019	21-Feb-19	Duplicate	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
Relative Percentage Difference		NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	
BH8_21022019	21-Feb-19	Primary	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
TRIP01_21022019	21-Feb-19	Triuplicate	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.1	
Relative Percentage Difference		NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	
TRIP BLANK_130319	13-Mar-19	Trip Blank	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
TRIP BLANK02_150319	15-Mar-19	Trip Blank	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
RINSTATE02_140319	14-Mar-19	Rinsate	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
BH7_140319	14-Mar-19	Primary	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
DUP02_140319	14-Mar-19	Duplicate	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
Relative Percentage Difference		NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	
BH7_140319	14-Mar-19	Primary	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
TRIP02_140319	14-Mar-19	Triuplicate	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.1	
Relative Percentage Difference		NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	
TRIP BLANK_160319	16-Jun-19	Trip Blank	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
TRIP BLANK_16072019	16-Jul-19	Trip Blank	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
RINSTATE06_16072019	16-Jul-19	Rinsate	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
RINSTATE07_15-Aug-19	Rinsate	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
TRIP BLANK_08_16092019	16-Sep-19	Trip Blank	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
RINSTATE_08_16092019	16-Sep-19	Rinsate	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
SW4_16092019	16-Sep-19	Primary	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
DUP08_16092019	16-Sep-19	Duplicate	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
Relative Percentage Difference		NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	
SW4_16092019	16-Sep-19	Primary	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
TRIP08_16092019	16-Sep-19	Triuplicate	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.1	
Relative Percentage Difference		NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	
TRIP BLANK_09_1931069	25-Sep-19	Trip Blank	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
RINSTATE_09_1931069	25-Sep-19	Rinsate	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
TRIPBLANK09_181119	18-Nov-19	Trip Blank	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
RINSTATE09_181119	18-Nov-19	Rinsate	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
SW4_181119	18-Nov-19	Primary	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
DUP09_181119	18-Nov-19	Duplicate	< 0.02	< 0.05	< 0.05	< 0.05	< 0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	
Relative Percentage Difference		NC	NC	NC	NC											

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**KLEINFELDER**  
Bright People. Right Solutions.

Client:		Site, COC and Contact Data										Laboratory:	
Kleinfelder Australia Pty Ltd 95 Mitchell Road Carefield NSW 2285 Phone: 02 4949 5200		Williantown Sands Syndicate QUOTE NUMBER ME114/19 Job No.: 20192026 Required TAT: 24 hrs 48 hrs 3 days 5 days 7 days Data QA level: LAB minimum unless specified										Nate Oltrey Sampler Name: 0478 224 363 Contact Number: NOttry@kleinfelder.com Contact e-mail: Phil name (if no sampler) Daniel (sousprek) PM e-mail: dkousbroek@kleinfelder.com	
Chain of Custody		Received by (print): <b>KO</b>		Received by (print): <b>AC</b>		Received by (print): <b>AC</b>		Received by (print): <b>AC</b>		Received by (print): <b>AC</b>		Received by (print): <b>AC</b>	
Reinforced by (print): <b>(sign)</b>		Date / Time: <b>13.7.20</b>		Date / Time: <b>16/7/2020</b>		Date / Time: <b>16/7/2020</b>		Date / Time: <b>10.5.2020</b>		Date / Time: <b>10.5.2020</b>		Date / Time: <b>10.5.2020</b>	
Notes:		Notes:		Notes:		Notes:		Notes:		Notes:		Notes:	
Sample ID	Lab ID	Sample Point	Sample Type	Date	Start Depth	End Depth	Units	# Containers	Organics	Metals	Other Analytes	Comments	
BH1		Water	170072020				5	X X		X			
BH2		Water	170072020				5	X X		X			
BH4		Water	170072020				7	X X		X			
BH6		Water	170072020				7	X X		X			
BH7		Water	170072020				7	X X		X			
BH8		Water	170072020				7	X X		X			
BH10		Water	170072020				5	X X		X			
BH11		Water	170072020				5	X X		X			
MW239S		Water	170072020				5	X X		X			
SW1		Water	170072020				7	X X		X			
SW2		Water	170072020				7	X X		X			
SW3		Water	170072020				7	X X		X			
SW4		Water	170072020				7	X X		X			
QW20		Water	170072020							X		Rinsate	
QW21		Water	170072020							X		Trip Blank	

Metals to be analysed: As, Cd, Cr, Cu, Fe, Mg, Pb, Zn, Hg – note sampling for iron and no nickel.

## BAILER PURGING AND SAMPLING LOG

Project Number:	Site Name:	Site Address:
Well ID:	Date:	Field Manager:
Well Diameter (mm):	Pre Purging Depth To Water (mTODC):	Post Purging Depth To Water (mTODC):

Sample Bottles Collected:

DAVOC Samples Collected:
--------------------------

Time	DTW (mTODC)	Volume Parged (L)	Temp (°C)	ROD		O2P		Description
				pH	EC (µS/cm)	TDS (mg/L)	pH	
<b>Stabilization Criteria:<sup>a</sup></b>								
BH4		16.8	1,84	212	16.3	4.7	343	No odour or shear, clear
BH7		17.6	3.4	70.	53	4.63	340	" " " "
BH1		17.6	3.12	108	81	5.4	135	" " " "
BH11		15.8	2.15	171	111	4.6	124	No odour, light brown, no shear
BH10								
BH2								
MW239S		15.3	10.35	0.27	0.21	12.7	144	No odour, no shear, Brown
BH5								
BH6		15.7	2.50	26204	249	4.68	+52.4	" " " L brown/Clear
BH7		15.8	1.96	155	122	4.83	-102	" " " "
BH8		16	2.79	268	210	4.89	-90	" " " "
SW4		17	4.87	447324	275	4.7	311	No odour or shear, clear
SW3		14	4.88	326	320	4.0	381	" " " "
		12	9	98	83	7.4	226	" " " "
								Light brown

SWI COMMENTS: \_\_\_\_\_

Minimum volume to be purged (3BV): \_\_\_\_\_ L

TD (m) - DTW (m) x 5 = \_\_\_\_\_ L

1BV

<sup>a</sup> Minimum volume to be purged except where wells are dry.  
These parameters may be considered stable when three consecutive readings (obtained several minutes apart) are within these levels.  
Source "Michigan Environmental Protection Authority, Groundwater Sampling Guidelines," Publication 669, April 2000.

GAUGING LOG

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*16.1.2013*

02.2.91

Project Number:	Site Name:	Site Address:
	WSS	

Time	Monitoring Well ID	Well Diameter (mm)	PID Reading (ppm)	Depth to PSH (mETOC)	Depth to Water (mETOC)	PSH Thickness (m)	Well Total Depth (mETOC)	Detailed Description of Well Condition & Any Repairs Required	Comments: HC Sheen, PSH Appearance & Thickness, Odour, Water Appearance
B	BH4			1.470					
	BH9			16.00 ±					
	BH2			6.035					
	BH1			6.958					
	BH11			4.484					
	BH10			3.743					
	SU2			0.0					
	BH12			7.057					
	MW2395			1300					
	BH5			5.760					
	BH6			1.728					
	BH7			1.430					
	BH8			2.020					
	SU4			4.7					
	SU3			3.0					
	SU1			5.4					

**COMMENTS:**

**NOTES:**

- TOC = Top of PVC Casing
- MBTOC = Metres Below Top of PVC Casing
- \* - If PSH is caused by present, visually confirm presence and thickness using a baffle. Record detailed description of the PSH.

**KENNARDS****HIRE****EQUIPMENT CERTIFICATION REPORT****PGN9003871 WATER QUALITY METER – MULTIFUNCTION (AQUATROLL 600)**Plant Number: 235616

SENSOR	CONCENTRATION	SPAN 1	SPAN 2	TRACEABILITY	PASS
pH	pH 4.00 / pH 7.00	4.00 pH	7.00 pH	344208/346922	<input checked="" type="checkbox"/>
Conductivity	<u>12.88</u> mS/cm	<u>12.88</u> mS/cm	N/A	346924	<input checked="" type="checkbox"/>
Dissolved Oxygen	Sodium Sulphite / Air	0% in Sodium Sulphite	<u>100</u> % Saturation in Air	10640	<input checked="" type="checkbox"/>
Turbidity	NTU	<u>0</u> NTU	<u>360</u> NTU	354767	<input checked="" type="checkbox"/>

Redox (ORP) \*\*240mV  4923      Electrode Operability Test 240mV ± 10%. Actual: 238 mV

Battery Status <u>50</u> %	Temperature <u>19.7</u> °C
Electrical Test & Tag (AS/NZS 3760)	Electrodes Cleaned and Checked

Note: Calibration solution traceability information is available upon request.

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

Checked By: Jacob Arnott Date: 9/7/20 Signed: J Arnott**Accessories List:**

User's Manual	USB Software	Blue Top Cap and Rubber Bumper
Comms Cable	Tablet with Vu-Situ App	Wireless Bluetooth Receiver
Charger With USB Cable	Desiccant	Backshell / Hanger Connector
Transit Case		

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## ATTACHMENT 3 LAB RESULTS



## CERTIFICATE OF ANALYSIS

Work Order	<b>: ES2024535</b>	Page	<b>: 1 of 15</b>
Client	<b>: KLEINFELDER AUSTRALIA PTY LTD</b>	Laboratory	<b>: Environmental Division Sydney</b>
Contact	<b>: DANIEL KOUSBROEK</b>	Contact	<b>: Shirley LeCornu</b>
Address	<b>: 95 Mitchell Rd Cardiff 2285</b>	Address	<b>: 277-289 Woodpark Road Smithfield NSW Australia 2164</b>
Telephone	<b>: ----</b>	Telephone	<b>: +6138549 9630</b>
Project	<b>: 20192026</b>	Date Samples Received	<b>: 16-Jul-2020 16:09</b>
Order number	<b>: ----</b>	Date Analysis Commenced	<b>: 17-Jul-2020</b>
C-O-C number	<b>: ----</b>	Issue Date	<b>: 23-Jul-2020 13:59</b>
Sampler	<b>: Nate Otlley</b>		
Site	<b>: Williamtown Sands Syndicate</b>		
Quote number	<b>: ME/114/19 ALS Compass</b>		
No. of samples received	<b>: 13</b>		
No. of samples analysed	<b>: 13</b>		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. 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.

### Signatures

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
Ashesh Patel	Senior 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
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, 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.

- ED041G: LOR raised for Sulfate on sample 5 due to sample matrix.
- 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: 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*



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Client sample ID		BH1	BH2	BH4	BH6	BH7
Compound	CAS Number	LOR	Unit	16-Jul-2020 00:00				
				Result	Result	Result	Result	Result
<b>EP231A: Perfluoroalkyl Sulfonic Acids - Continued</b>								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	---	---	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	---	---	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	---	---	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	---	---	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	---	---	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	---	---	<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
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	---	---	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	---	---	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	---	---	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	---	---	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	---	---	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	---	---	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	---	---	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDsDA)	307-55-1	0.02	µg/L	---	---	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTsDA)	72629-94-8	0.02	µg/L	---	---	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTsDA)	376-06-7	0.05	µg/L	---	---	<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
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	---	---	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	---	---	<0.05	<0.05	<0.05

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Client sample ID		BH1	BH2	BH4	BH6	BH7
Compound	CAS Number	LOR	Unit	16-Jul-2020 00:00				
				Result	Result	Result	Result	Result
<b>EP231C: Perfluoroalkyl Sulfonamides - Continued</b>								
N-Methyl perfluoroctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	---	---	<0.05	<0.05	<0.05
N-Ethyl perfluoroctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	---	---	<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
N-Ethyl perfluoroctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	---	---	<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
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	---	---	<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
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	---	---	<0.05	<0.05	<0.05
<b>EP231P: PFAS Sums</b>								
Sum of PFAS	----	0.01	µg/L	---	---	<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
Sum of PFAS (WA DER List)	----	0.01	µg/L	---	---	<0.01	<0.01	<0.01
<b>EP080S: TPH(V)/BTEX Surrogates</b>								
1,2-Dichloroethane-D4	17060-07-0	2	%	108	113	109	111	112
Toluene-D8	2037-26-5	2	%	104	102	105	103	104
4-Bromofluorobenzene	460-00-4	2	%	93.5	96.4	95.3	95.4	94.0
<b>EP231S: PFAS Surrogate</b>								
13C4-PFOS	----	0.02	%	---	---	95.2	93.7	98.3
13C8-PFOA	----	0.02	%	---	---	104	98.3	102

## **Analytical Results**

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Client sample ID		BH8	BH11	MW239S	SW1	SW3	
Compound	CAS Number	LOR	Unit	Client sampling date / time	16-Jul-2020 00:00				
				Result	Result	Result	Result	Result	Result
<b>EK040P: Fluoride by PC Titrator - Continued</b>									
Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	0.2
<b>EN055: Ionic Balance</b>									
ø Total Anions	---	0.01	meq/L	2.49	1.32	3.80	1.34	4.07	
ø Total Cations	---	0.01	meq/L	---	---	---	---	---	3.75
ø Total Cations	---	0.01	meq/L	2.59	1.29	3.59	1.24	---	---
ø Ionic Balance	---	0.01	%	---	---	---	---	---	4.15
ø Ionic Balance	---	0.01	%	---	---	2.86	---	---	---
<b>EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup</b>									
C10 - C14 Fraction	---	50	µg/L	<50	<50	<50	<50	<50	<50
C15 - C28 Fraction	---	100	µg/L	<100	<100	<100	<100	<100	<100
C29 - C36 Fraction	---	50	µg/L	<50	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	---	50	µg/L	<50	<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	<100
>C16 - C34 Fraction	---	100	µg/L	<100	<100	<100	<100	<100	<100
>C34 - C40 Fraction	---	100	µg/L	<100	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	---	100	µg/L	<100	<100	<100	<100	<100	<100
>C10 - C16 Fraction minus Naphthalene (F2)	---	100	µg/L	<100	<100	<100	<100	<100	<100
<b>EP080/071: Total Petroleum Hydrocarbons</b>									
C6 - C9 Fraction	---	20	µg/L	<20	<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	<20
^ C6 - C10 Fraction minus BTEX	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20	<20
<b>EP080: BTEXN</b>									
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2	<2
^ Total Xylenes	---	2	µg/L	<2	<2	<2	<2	<2	<2
^ Sum of BTEX	---	1	µg/L	<1	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5	<5

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Client sample ID		BH8	BH11	MW239S	SW1	SW3
Compound	CAS Number	LOR	Unit	16-Jul-2020 00:00				
				Result	Result	Result	Result	Result
<b>EP231A: Perfluoroalkyl Sulfonic Acids</b>								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	---	---	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	---	---	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	---	---	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	---	---	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	---	---	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<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
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	---	---	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	---	---	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	---	---	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	---	---	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	---	---	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	---	---	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	---	---	<0.02	<0.02
Perfluorododecanoic acid (PFDmA)	307-55-1	0.02	µg/L	<0.02	---	---	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	---	---	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<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
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	---	---	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	---	---	<0.05	<0.05

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Client sample ID		BH8	BH11	MW239S	SW1	SW3
Compound	CAS Number	LOR	Unit	16-Jul-2020 00:00				
				Result	Result	Result	Result	Result
<b>EP231C: Perfluoroalkyl Sulfonamides - Continued</b>								
N-Methyl perfluoroctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	---	---	<0.05	<0.05
N-Ethyl perfluoroctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<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
N-Ethyl perfluoroctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<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
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<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
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	---	---	<0.05	<0.05
<b>EP231P: PFAS Sums</b>								
Sum of PFAS	----	0.01	µg/L	<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
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	---	---	<0.01	<0.01
<b>EP080S: TPH(V)/BTEX Surrogates</b>								
1,2-Dichloroethane-D4	17060-07-0	2	%	111	110	113	115	110
Toluene-D8	2037-26-5	2	%	103	101	99.8	102	103
4-Bromofluorobenzene	460-00-4	2	%	95.4	92.4	97.0	94.3	95.6
<b>EP231S: PFAS Surrogate</b>								
13C4-PFOS	----	0.02	%	97.8	---	---	91.3	95.8
13C8-PFOA	----	0.02	%	102	---	---	97.9	104

## **Analytical Results**

## *Analytical Results*

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Client sample ID		SW4	QW20 Rinsate	QW21 Trip Blank	---	---
		Client sampling date / time		16-Jul-2020 00:00	16-Jul-2020 00:00	16-Jul-2020 00:00	---	---
Compound	CAS Number	LOR	Unit	ES2024535-011	ES2024535-012	ES2024535-013	-----	-----
				Result	Result	Result	---	---
<b>EP231A: Perfluoroalkyl Sulfonic Acids - Continued</b>								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	---	---
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	---	---
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	---	---
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	---	---
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	---	---
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<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	---	---
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	---	---
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	---	---
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	---	---
Perfluoroctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	---	---
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	---	---
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	---	---
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	---	---
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	---	---
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	---	---
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	---	---
<b>EP231C: Perfluoroalkyl Sulfonamides</b>								
Perfluoroctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	---	---
N-Methyl perfluoroctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	---	---
N-Ethyl perfluoroctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	---	---

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Client sample ID		SW4	QW20 Rinsate	QW21 Trip Blank	---	---
Client sampling date / time				16-Jul-2020 00:00	16-Jul-2020 00:00	16-Jul-2020 00:00	---	---
Compound	CAS Number	LOR	Unit	ES2024535-011	ES2024535-012	ES2024535-013	-----	-----
				Result	Result	Result	---	---
<b>EP231C: Perfluoroalkyl Sulfonamides - Continued</b>								
N-Methyl perfluoroctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	---	---
N-Ethyl perfluoroctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<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	---	---
N-Ethyl perfluoroctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<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	---	---
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<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	---	---
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	---	---
<b>EP231P: PFAS Sums</b>								
Sum of PFAS	---	0.01	µg/L	<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	---	---
Sum of PFAS (WA DER List)	---	0.01	µg/L	<0.01	<0.01	<0.01	---	---
<b>EP080S: TPH(V)/BTEX Surrogates</b>								
1,2-Dichloroethane-D4	17060-07-0	2	%	125	122	122	---	---
Toluene-D8	2037-26-5	2	%	97.7	99.4	104	---	---
4-Bromofluorobenzene	460-00-4	2	%	96.0	94.0	97.3	---	---
<b>EP231S: PFAS Surrogate</b>								
13C4-PFOS	---	0.02	%	91.0	93.5	99.2	---	---
13C8-PFOA	---	0.02	%	95.1	103	104	---	---

## 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

## QUALITY CONTROL REPORT

Work Order	: ES2024535	Page	: 1 of 11
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	: 20192026	Date Samples Received	: 16-Jul-2020
Order number	: ----	Date Analysis Commenced	: 17-Jul-2020
C-O-C number	: ----	Issue Date	: 23-Jul-2020
Sampler	: Nate Ottley		
Site	: Williamtown Sands Syndicate		
Quote number	: ME/114/19 ALS Compass		
No. of samples received	: 13		
No. of samples analysed	: 13		



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

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. 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
Ashesh Patel	Senior 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
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW

## **General Comments**

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

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

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

**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	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
<b>ED045G: Chloride by Discrete Analyser (QC Lot: 3145121) - continued</b>									
ES2024535-001	BH1	ED045G: Chloride	16887-00-6	1	mg/L	24	24	0.00	0% - 20%
ES2024555-006	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	21	20	0.00	0% - 20%
<b>ED093F: Dissolved Major Cations (QC Lot: 3147795)</b>									
ES2024535-001	BH1	ED093F: Calcium	7440-70-2	1	mg/L	<1	<1	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	2	2	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	17	15	11.0	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.00	No Limit
ES2024405-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	212	211	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	126	126	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	130	130	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.00	No Limit
<b>ED093F: Dissolved Major Cations (QC Lot: 3147800)</b>									
ES2024557-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	4	4	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	2	2	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	22	21	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.00	No Limit
<b>EG020F: Dissolved Metals by ICP-MS (QC Lot: 3147794)</b>									
ES2024535-001	BH1	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: Chromium	7440-47-3	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.014	0.014	0.00	0% - 50%
		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	0.010	0.00	0% - 50%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.080	0.081	1.55	0% - 50%
		EG020A-F: Iron	7439-89-6	0.05	mg/L	6.22	6.26	0.673	0% - 20%
ES2024405-001	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: Chromium	7440-47-3	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	0.094	0.092	2.19	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.00	No Limit
<b>EG020F: Dissolved Metals by ICP-MS (QC Lot: 3147798)</b>									
ES2024535-002	BH2	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: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.029	0.029	0.00	0% - 20%
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit

**Sub-Matrix: WATER**

		Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
<b>EG020F: Dissolved Metals by ICP-MS (QC Lot: 3147798) - continued</b>									
ES2024535-002	BH2	EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.012	0.013	0.00	0% - 50%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.033	0.031	4.64	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.00	No Limit
ES2024557-002	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: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.010	0.009	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	0.054	0.053	0.00	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.006	0.006	0.00	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	1.38	1.39	0.956	0% - 20%
<b>EG020F: Dissolved Metals by ICP-MS (QC Lot: 3150019)</b>									
ES2024279-001	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: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.020	0.019	0.00	0% - 50%
		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	0.074	0.075	2.36	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.048	0.047	2.18	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.00	No Limit
ES2024535-013	QW21 Trip Blank	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: Chromium	7440-47-3	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	<0.001	<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: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.00	No Limit
<b>EG035F: Dissolved Mercury by FIMS (QC Lot: 3147796)</b>									
ES2024481-006	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
ES2024405-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
<b>EG035F: Dissolved Mercury by FIMS (QC Lot: 3147799)</b>									
ES2024535-010	SW3	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
WN2006429-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
<b>EG035F: Dissolved Mercury by FIMS (QC Lot: 3150020)</b>									
ES2024465-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
ES2024489-004	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: 3146237)</b>									
ES2024535-008	MW239S	EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	0.00	No Limit

**Sub-Matrix: WATER**

Laboratory Duplicate (DUP) Report									
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
<b>EK040P: Fluoride by PC Titrator (QC Lot: 3146237) - continued</b>									
ES2024535-003	BH4	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: 3146883)</b>									
ES2024535-001	BH1	EP080: C6 - C9 Fraction	---	20	µg/L	<20	<20	0.00	No Limit
ES2024535-011	SW4	EP080: C6 - C9 Fraction	---	20	µg/L	<20	<20	0.00	No Limit
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3146883)</b>									
ES2024535-001	BH1	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
ES2024535-011	SW4	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
<b>EP080: BTEXN (QC Lot: 3146883)</b>									
ES2024535-001	BH1	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	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		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
		EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
ES2024535-011	SW4	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	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		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

## Method Blank (MB) and Laboratory Control Spike (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 Spike (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 (%)	Recovery Limits (%)	
					LCS	Low	High	
<b>EA005P: pH by PC Titrator (QCLot: 3146235)</b>								
EA005-P: pH Value	---	---	pH Unit	---	4 pH Unit 7 pH Unit	101 99.8	98.0 98.0	102 102
<b>EA005P: pH by PC Titrator (QCLot: 3146239)</b>								
EA005-P: pH Value	---	---	pH Unit	---	4 pH Unit 7 pH Unit	100 99.7	98.0 98.0	102 102
<b>EA010P: Conductivity by PC Titrator (QCLot: 3146234)</b>								
EA010-P: Electrical Conductivity @ 25°C	---	1	µS/cm	<1	2100 µS/cm	97.4	95.0	113
<b>EA010P: Conductivity by PC Titrator (QCLot: 3146238)</b>								
EA010-P: Electrical Conductivity @ 25°C	---	1	µS/cm	<1	2100 µS/cm	# 94.9	95.0	113
<b>ED037P: Alkalinity by PC Titrator (QCLot: 3146236)</b>								
ED037-P: Total Alkalinity as CaCO <sub>3</sub>	---	---	mg/L	---	200 mg/L 50 mg/L	102 129	81.0 70.0	111 130
<b>ED041G: Sulfate (Turbidimetric) as SO<sub>4</sub> 2- by DA (QCLot: 3145120)</b>								
ED041G: Sulfate as SO <sub>4</sub> - Turbidimetric	14808-79-8	1	mg/L	<1 <1	25 mg/L 500 mg/L	99.8 95.6	82.0 82.0	122 122
<b>ED045G: Chloride by Discrete Analyser (QCLot: 3145121)</b>								
ED045G: Chloride	16887-00-6	1	mg/L	<1 <1	10 mg/L 1000 mg/L	93.5 95.8	80.9 80.9	127 127
<b>ED093F: Dissolved Major Cations (QCLot: 3147795)</b>								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	104	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	107	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	102	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	99.6	85.0	113
<b>ED093F: Dissolved Major Cations (QCLot: 3147800)</b>								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	102	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	103	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	99.4	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	96.8	85.0	113
<b>EG020F: Dissolved Metals by ICP-MS (QCLot: 3147794)</b>								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	95.4	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	95.4	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	95.3	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	92.4	81.0	111

Sub-Matrix: WATER

Method: Compound	CAS Number	LOR	Unit	Result	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
					LCS	Low	High	
<b>EG020F: Dissolved Metals by ICP-MS (QCLot: 3147794) - continued</b>								
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	95.6	82.0	110
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	93.9	81.0	117
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	95.6	82.0	112
<b>EG020F: Dissolved Metals by ICP-MS (QCLot: 3147798)</b>								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	94.7	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	93.0	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	89.6	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	90.7	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	85.3	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	94.3	82.0	110
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	91.6	81.0	117
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	91.1	82.0	112
<b>EG020F: Dissolved Metals by ICP-MS (QCLot: 3150019)</b>								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	100	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	94.9	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	95.3	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	94.5	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	96.0	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	95.8	82.0	110
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	94.8	81.0	117
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	97.8	82.0	112
<b>EG035F: Dissolved Mercury by FIMS (QCLot: 3147796)</b>								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	98.9	83.0	105
<b>EG035F: Dissolved Mercury by FIMS (QCLot: 3147799)</b>								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	97.1	83.0	105
<b>EG035F: Dissolved Mercury by FIMS (QCLot: 3150020)</b>								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	93.3	83.0	105
<b>EK040P: Fluoride by PC Titrator (QCLot: 3146237)</b>								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	101	82.0	116
<b>EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup (QCLot: 3144800)</b>								
EP071SG: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	77.6	55.8	112
EP071SG: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	88.1	71.6	113
EP071SG: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	89.1	56.0	121
<b>EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup (QCLot: 3149429)</b>								
EP071SG: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	70.0	55.8	112
EP071SG: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	90.9	71.6	113

**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 (%) LCS</b>	<b>Recovery Limits (%) Low High</b>	
<b>EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup (QCLot: 3149429) - continued</b>								
EP071SG: C29 - C36 Fraction	---	50	µg/L	<50	400 µg/L	90.6	56.0	121
<b>EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup (QCLot: 3144800)</b>								
EP071SG: >C10 - C16 Fraction	---	100	µg/L	<100	500 µg/L	87.9	57.9	119
EP071SG: >C16 - C34 Fraction	---	100	µg/L	<100	700 µg/L	105	62.5	110
EP071SG: >C34 - C40 Fraction	---	100	µg/L	<100	300 µg/L	95.6	61.5	121
<b>EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup (QCLot: 3149429)</b>								
EP071SG: >C10 - C16 Fraction	---	100	µg/L	<100	500 µg/L	78.6	57.9	119
EP071SG: >C16 - C34 Fraction	---	100	µg/L	<100	700 µg/L	94.5	62.5	110
EP071SG: >C34 - C40 Fraction	---	100	µg/L	<100	300 µg/L	86.1	61.5	121
<b>EP080/071: Total Petroleum Hydrocarbons (QCLot: 3146883)</b>								
EP080: C6 - C9 Fraction	---	20	µg/L	<20	260 µg/L	90.9	75.0	127
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3146883)</b>								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	90.5	75.0	127
<b>EP080: BTEXN (QCLot: 3146883)</b>								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	95.0	70.0	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	91.1	69.0	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	92.6	70.0	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	92.8	69.0	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	95.2	72.0	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	94.7	70.0	120
<b>EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3147614)</b>								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	79.2	72.0	130
EP231X: Perfluoropentane sulfonic acid (PPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	87.0	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	81.8	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	87.0	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	83.2	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	81.2	53.0	142
<b>EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3147614)</b>								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	80.7	73.0	129
EP231X: Perfluoropentanoic acid (PPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	87.2	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	87.8	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	86.2	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	87.2	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	95.6	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	91.4	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	89.2	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	90.0	72.0	134

**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 (%) LCS</b>	<b>Recovery Limits (%) Low High</b>	
<b>EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3147614) - continued</b>								
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	85.8	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	88.4	71.0	132
<b>EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3147614)</b>								
EP231X: Perfluoroctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	89.0	67.0	137
EP231X: N-Methyl perfluoroctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	99.9	68.0	141
EP231X: N-Ethyl perfluoroctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	86.9	62.6	147
EP231X: N-Methyl perfluoroctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	87.0	66.0	145
EP231X: N-Ethyl perfluoroctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	85.9	57.6	145
EP231X: N-Methyl perfluoroctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	93.8	65.0	136
EP231X: N-Ethyl perfluoroctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	87.4	61.0	135
<b>EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3147614)</b>								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	85.2	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	86.8	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	94.6	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	92.8	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>Client 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>Recovery Limits (%)</b>	<b>MS</b>
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3145120)</b>							
ES2024535-001	BH1	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	118	70.0	130
<b>ED045G: Chloride by Discrete Analyser (QCLot: 3145121)</b>							
ES2024535-001	BH1	ED045G: Chloride	16887-00-6	250 mg/L	114	70.0	130
<b>EG020F: Dissolved Metals by ICP-MS (QCLot: 3147794)</b>							
ES2024405-002	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	82.6	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	86.5	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	83.0	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	73.5	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	77.3	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	86.0	70.0	130

**Sub-Matrix: WATER**

				Matrix Spike (MS) Report			
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike	Spike Recovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High
<b>EG020F: Dissolved Metals by ICP-MS (QCLot: 3147794) - continued</b>							
ES2024405-002	Anonymous	EG020A-F: Zinc	7440-66-6	1 mg/L	84.2	70.0	130
<b>EG020F: Dissolved Metals by ICP-MS (QCLot: 3147798)</b>							
ES2024535-003	BH4	EG020A-F: Arsenic	7440-38-2	1 mg/L	86.8	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	91.1	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	87.4	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	84.8	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	78.0	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	90.4	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	88.4	70.0	130
<b>EG020F: Dissolved Metals by ICP-MS (QCLot: 3150019)</b>							
ES2024464-001	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	97.0	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	95.7	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	96.2	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	94.5	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	103	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	97.2	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	98.1	70.0	130
<b>EG035F: Dissolved Mercury by FIMS (QCLot: 3147796)</b>							
ES2024390-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	90.0	70.0	130
<b>EG035F: Dissolved Mercury by FIMS (QCLot: 3147799)</b>							
ES2024535-009	SW1	EG035F: Mercury	7439-97-6	0.01 mg/L	95.7	70.0	130
<b>EG035F: Dissolved Mercury by FIMS (QCLot: 3150020)</b>							
ES2024464-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	89.1	70.0	130
<b>EK040P: Fluoride by PC Titrator (QCLot: 3146237)</b>							
ES2024322-001	Anonymous	EK040P: Fluoride	16984-48-8	5 mg/L	104	70.0	130
<b>EP080/071: Total Petroleum Hydrocarbons (QCLot: 3146883)</b>							
ES2024535-001	BH1	EP080: C6 - C9 Fraction	----	325 µg/L	115	70.0	130
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3146883)</b>							
ES2024535-001	BH1	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	106	70.0	130
<b>EP080: BTEXN (QCLot: 3146883)</b>							
ES2024535-001	BH1	EP080: Benzene	71-43-2	25 µg/L	99.4	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	99.0	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	101	70.0	130
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	102	70.0	130
		EP080: ortho-Xylene	106-42-3				
			95-47-6	25 µg/L	104	70.0	130

Sub-Matrix: WATER

				Matrix Spike (MS) Report			
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike	Spike Recovery(%)	Recovery Limits (%)	
EP080: BTEXN (QCLot: 3146883) - continued				Concentration	MS	Low	High
ES2024535-001	BH1	EP080: Naphthalene	91-20-3	25 µg/L	100.0	70.0	130

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

Work Order	: ES2024535	Page	: 1 of 11
Client	: KLEINFELDER AUSTRALIA PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: DANIEL KOUSBROEK	Telephone	: +6138549 9630
Project	: 20192026	Date Samples Received	: 16-Jul-2020
Site	: Williamtown Sands Syndicate	Issue Date	: 23-Jul-2020
Sampler	: Nate Ottley	No. of samples received	: 13
Order number	: ----	No. of samples analysed	: 13

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** Matrix Spike outliers occur.
- Laboratory Control 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>Laboratory Control Spike (LCS) Recoveries</b>							
EA010P: Conductivity by PC Titrator	QC-MRG2-31462380	---	Electrical Conductivity @ 25°C	---	94.9 %	95.0-113%	Recovery less than lower control limit

## 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, BH11, SW1, SW4	BH2, BH6, BH8, MW239S, SW3,	----	----	----	17-Jul-2020	16-Jul-2020

## 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	0	16	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	0	13	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
<b>Matrix Spikes (MS)</b>					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	16	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	0	13	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

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, BH11, SW1, SW4	BH2, BH6, BH8, MW239S, SW3,	16-Jul-2020	----	----	----	17-Jul-2020	16-Jul-2020	✗					
<b>EA010P: Conductivity by PC Titrator</b>														
Clear Plastic Bottle - Natural (EA010-P)	BH1, BH4, BH7, BH11, SW1, SW4	BH2, BH6, BH8, MW239S, SW3,	16-Jul-2020	----	----	----	17-Jul-2020	13-Aug-2020	✓					
<b>EA065: Total Hardness as CaCO<sub>3</sub></b>														
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)	BH1, BH4, BH7, BH11, SW1, SW4	BH2, BH6, BH8, MW239S, SW3,	16-Jul-2020	----	----	----	20-Jul-2020	13-Aug-2020	✓					
<b>ED037P: Alkalinity by PC Titrator</b>														
Clear Plastic Bottle - Natural (ED037-P)	BH1, BH4, BH7, BH11, SW1, SW4	BH2, BH6, BH8, MW239S, SW3,	16-Jul-2020	----	----	----	17-Jul-2020	30-Jul-2020	✓					
<b>ED041G: Sulfate (Turbidimetric) as SO<sub>4</sub> 2- by DA</b>														
Clear Plastic Bottle - Natural (ED041G)	BH1, BH4, BH7, BH11, SW1, SW4	BH2, BH6, BH8, MW239S, SW3,	16-Jul-2020	----	----	----	17-Jul-2020	13-Aug-2020	✓					

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>ED045G: Chloride by Discrete Analyser</b>									
Clear Plastic Bottle - Natural (ED045G)	BH1, BH4, BH7, BH11, SW1, SW4	BH2, BH6, BH8, MW239S, SW3,	16-Jul-2020	---	---	---	17-Jul-2020	13-Aug-2020	✓
<b>ED093F: Dissolved Major Cations</b>									
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)	BH1, BH4, BH7, BH11, SW1, SW4	BH2, BH6, BH8, MW239S, SW3,	16-Jul-2020	---	---	---	20-Jul-2020	13-Aug-2020	✓
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)	BH1, BH4, BH7, BH11, SW1, SW4	BH2, BH6, BH8, MW239S, SW3,	16-Jul-2020	---	---	---	20-Jul-2020	12-Jan-2021	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)	QW20 - Rinsate,	QW21 - Trip Blank	16-Jul-2020	---	---	---	21-Jul-2020	12-Jan-2021	✓
<b>EG035F: Dissolved Mercury by FIMS</b>									
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)	BH1, BH4, BH7, BH11, SW1, SW4	BH2, BH6, BH8, MW239S, SW3,	16-Jul-2020	---	---	---	20-Jul-2020	13-Aug-2020	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)	QW20 - Rinsate,	QW21 - Trip Blank	16-Jul-2020	---	---	---	21-Jul-2020	13-Aug-2020	✓

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>EK040P: Fluoride by PC Titrator</b>														
Clear Plastic Bottle - Natural (EK040P)	BH1, BH4, BH7, BH11, SW1, SW4	BH2, BH6, BH8, MW239S, SW3,	16-Jul-2020	----	----	---	17-Jul-2020	13-Aug-2020	✓					
<b>EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup</b>														
Amber Glass Bottle - Unpreserved (EP071SG)	BH1, BH4, BH7, BH11, SW1, SW4,	BH2, BH6, BH8, MW239S, SW3, QW20 - Rinsate	16-Jul-2020	20-Jul-2020	23-Jul-2020	✓	22-Jul-2020	29-Aug-2020	✓					
Amber Glass Bottle - Unpreserved (EP071SG)	QW21 - Trip Blank		16-Jul-2020	21-Jul-2020	23-Jul-2020	✓	21-Jul-2020	30-Aug-2020	✓					
<b>EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup</b>														
Amber Glass Bottle - Unpreserved (EP071SG)	BH1, BH4, BH7, BH11, SW1, SW4,	BH2, BH6, BH8, MW239S, SW3, QW20 - Rinsate	16-Jul-2020	20-Jul-2020	23-Jul-2020	✓	22-Jul-2020	29-Aug-2020	✓					
Amber Glass Bottle - Unpreserved (EP071SG)	QW21 - Trip Blank		16-Jul-2020	21-Jul-2020	23-Jul-2020	✓	21-Jul-2020	30-Aug-2020	✓					
<b>EP080/071: Total Petroleum Hydrocarbons</b>														
Amber VOC Vial - Sulfuric Acid (EP080)	BH1, BH4, BH7, BH11, SW1, SW4, QW21 - Trip Blank	BH2, BH6, BH8, MW239S, SW3, QW20 - Rinsate,	16-Jul-2020	20-Jul-2020	30-Jul-2020	✓	20-Jul-2020	30-Jul-2020	✓					

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 Recoverable Hydrocarbons - NEPM 2013 Fractions</b>														
Amber VOC Vial - Sulfuric Acid (EP080)	BH1, BH4, BH7, BH11, SW1, SW4, QW21 - Trip Blank	BH2, BH6, BH8, MW239S, SW3, QW20 - Rinsate,	16-Jul-2020	20-Jul-2020	30-Jul-2020	✓	20-Jul-2020	30-Jul-2020	✓					
<b>EP080: BTEXN</b>														
Amber VOC Vial - Sulfuric Acid (EP080)	BH1, BH4, BH7, BH11, SW1, SW4, QW21 - Trip Blank	BH2, BH6, BH8, MW239S, SW3, QW20 - Rinsate,	16-Jul-2020	20-Jul-2020	30-Jul-2020	✓	20-Jul-2020	30-Jul-2020	✓					
<b>EP231A: Perfluoroalkyl Sulfonic Acids</b>														
HDPE (no PTFE) (EP231X)	BH4, BH7, SW1, SW4, QW21 - Trip Blank	BH6, BH8, SW3, QW20 - Rinsate,	16-Jul-2020	20-Jul-2020	12-Jan-2021	✓	21-Jul-2020	12-Jan-2021	✓					
<b>EP231B: Perfluoroalkyl Carboxylic Acids</b>														
HDPE (no PTFE) (EP231X)	BH4, BH7, SW1, SW4, QW21 - Trip Blank	BH6, BH8, SW3, QW20 - Rinsate,	16-Jul-2020	20-Jul-2020	12-Jan-2021	✓	21-Jul-2020	12-Jan-2021	✓					
<b>EP231C: Perfluoroalkyl Sulfonamides</b>														
HDPE (no PTFE) (EP231X)	BH4, BH7, SW1, SW4, QW21 - Trip Blank	BH6, BH8, SW3, QW20 - Rinsate,	16-Jul-2020	20-Jul-2020	12-Jan-2021	✓	21-Jul-2020	12-Jan-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>EP231D: (n:2) Fluorotelomer Sulfonic Acids</b>								
HDPE (no PTFE) (EP231X)	BH4, BH7, SW1, SW4, QW21 - Trip Blank	BH6, BH8, SW3, QW20 - Rinsate,	16-Jul-2020	20-Jul-2020	12-Jan-2021	✓	21-Jul-2020	12-Jan-2021
<b>EP231P: PFAS Sums</b>								
HDPE (no PTFE) (EP231X)	BH4, BH7, SW1, SW4, QW21 - Trip Blank	BH6, BH8, SW3, QW20 - Rinsate,	16-Jul-2020	20-Jul-2020	12-Jan-2021	✓	21-Jul-2020	12-Jan-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	2	20	10.00	10.00	✓ NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser		ED045G	2	20	10.00	10.00	✓ NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator		EA010-P	4	40	10.00	10.00	✓ NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS		EG035F	6	47	12.77	10.00	✓ NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A		EG020A-F	6	51	11.76	10.00	✓ NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator		EK040P	2	20	10.00	10.00	✓ NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved		ED093F	3	30	10.00	10.00	✓ NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS		EP231X	0	16	0.00	10.00	✗ NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator		EA005-P	4	40	10.00	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	13	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	2	20	10.00	10.00	✓ NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser		ED045G	2	20	10.00	10.00	✓ NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator		EA010-P	2	40	5.00	5.00	✓ NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS		EG035F	3	47	6.38	5.00	✓ NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A		EG020A-F	3	51	5.88	5.00	✓ NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator		EK040P	1	20	5.00	5.00	✓ NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved		ED093F	2	30	6.67	5.00	✓ NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS		EP231X	1	16	6.25	5.00	✓ NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator		EA005-P	4	40	10.00	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	2	13	15.38	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	20	5.00	5.00	✓ NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator		EA010-P	2	40	5.00	5.00	✓ NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS		EG035F	3	47	6.38	5.00	✓ NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A		EG020A-F	3	51	5.88	5.00	✓ NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator		EK040P	1	20	5.00	5.00	✓ NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved		ED093F	2	30	6.67	5.00	✓ NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS		EP231X	1	16	6.25	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	2	13	15.38	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	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	3	47	6.38	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	3	51	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	16	0.00	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	13	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 (2013) 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 (2013) 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 (2013) 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) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO <sub>4</sub> 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO <sub>4</sub> . Dissolved sulfate is determined in a 0.45μm filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO <sub>4</sub> suspension is measured by a photometer and the SO <sub>4</sub> -2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) 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 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	<p>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 (2013) Schedule B(3)</p> <p>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 (2013) Schedule B(3)</p> <p>Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3)</p>
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 (SnCl <sub>2</sub> )(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 SnCl <sub>2</sub> which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods			
	Method	Matrix	Method Descriptions
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 (2013) 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 (2013) Schedule B(3)
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	EP071SG	WATER	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C36. This method is compliant with NEPM (2013) Schedule B(3) (Method 506.1)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260D 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 (2013) 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 - 3510B 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 (2013) 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 sparging.
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

Client:		Site, COC AND CONTACT DATA				Laboratory:																																																																																																																	
Kleinfeild Australia Pty Ltd 95 Mitchell Road Cardiff, NSW 2285 Phone: 02 4949 5200		Site Name:	Williamtown Sands Syndicate	Sampler Name:	Nate Ootley	ALS 5585 Maitland Road, Mayfield West, NSW 2304																																																																																																																	
		QUOTE NUMBER	ME/114/19	Contact Number:	0478 224 503																																																																																																																		
		Job No.	20190208	Contact e-mail:	NOTTER@kleinfeild.com																																																																																																																		
		Required TAT:	24 hrs	3 days	5 days	PM name (if not sampler), Daniel Kousbroek																																																																																																																	
		Data QA level:	LAB minimum unless specified																																																																																																																				
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Relinquished by (print):  <i>RE</i>		N. Ootley	Received by (print):  <i>AC</i>	Relinquished:  <i>RE</i>	Received by:  <i>AN</i>	Send Results to:  dkousbroek@kleinfeild.com & toverton@kleinfeild.com																																																																																																																	
Date / Time:  <i>16.7.20</i>		Date / Time:  <i>16/7/2020</i>	Date / Time:  <i>16/7/2020</i>	Date / Time:  <i>16/7/2020</i>	Date / Time:  <i>16/7/2020</i>	95 Mitchell Road Cardiff, NSW 2285																																																																																																																	
Notes:  <i>Q16.10</i>		Temp. (°C)  <i>-0.5°C</i>	Temp. (°C)  <i>-0.5°C</i>	Temp. (°C)  <i>-0.5°C</i>	Temp. (°C)  <i>-0.5°C</i>	newcastle@kleinfeild.com Phone: 02 4949 5200																																																																																																																	
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Environmental Division  
 Sydney  
 Work Order Reference  
**ES2024535**



Telephone - 612-8784 8565

Metals to be analysed: As, Cd, Cr, Cu, Fe, Mg, Pb, Zn, Hg - note sampling for Iron and no nickel