APPENDIX 6. GROUNDWATER, SURFACE WATER AND PFAS

Preliminary Documentation

Cabbage Tree Road Sand Quarry - (EPBC 2016-7852)

The following background documents are included in this Appendix:

1. Umwelt, November 2015. Groundwater Impact Assessment.
2. Umwelt, October 2016. Potential for Sand Extraction to Increase Flooding Impacts in Surrounding Area.
3. RCA, June 2016. Groundwater Assessment.
4. Umwelt, November 2016. Response to Hydro Simulation Peer Review 1.
5. Umwelt, January 2017. Response to Hydro Simulation Peer Review 2.
6. Kleinfelder, February 2017. Soil Sampling Assessment.
7. Kleinfelder, June 2017. Water Sampling Assessment.
8. Kleinfelder, June 2017. Contingency Management Plan for Potential PFAS Disturbance during Construction Activities.
9. Contamination Water Working Group Comments on the EIS; and Correspondence with Hunter Water Corporation: consultation to develop specific controls and management practices for the site operations.
10. Williamtown Contamination Expert Panel Letter.

Kleinfelder Australia Pty Ltd
ABN: 23 146 082 500
95 Mitchell Road
Cardiff, NSW 2285
T| 1300 881 869 **F|** 1300 881 035
www.kleinfelder.com/australia

21 February 2017
Document No: NCA17L54919.

Williamtown Sand Syndicate Pty Ltd
C/O Arbus (Murray Towndrow)

Attention: Murray Towndrow

Email: murray@arbus.com.au

Subject: **Per- and poly-fluorinated alkyl substances assessment**
Proposed Williamtown Sand Quarry
398 Cabbage Tree Road, Williamtown

1. INTRODUCTION

Kleinfelder Australia Pty Ltd (Kleinfelder) was commissioned by Williamtown Sand Syndicate Pty Limited (WSS) to undertake a soil assessment for potential per- and poly-fluorinated alkyl substances (PFAS) at the proposed Williamtown Sand Quarry located at 398 Cabbage Tree Road, Williamtown, New South Wales (the site). The site location is shown on the attached **Figure 1**.

1.1 BACKGROUND

Activities at the proposed quarry will involve the progressive clearing of vegetation and extraction of sand for sale as a raw fill sand or processed sand product. The proposed sand resource is up to 19 metres (m) thick targeting Pleistocene sand dune formations. The quarry will be limited to extraction of sand down to 0.7 m above the highest predicted groundwater level, to maintain a buffer above groundwater (this equates to a quarry floor at approximately 3.5 to 5.5 m above Australian Height Datum - AHD). The quarry does not propose to utilise the groundwater from the site for its operations.

The site is located within the New South Wales Environment Protection Authority (EPA) Williamtown RAAF PFAS Investigation Area (**Figure 1**) associated with historical aqueous film-forming foam (AFFF) use at the RAAF base. There is no known historical on-site use of AFFF (or other substances containing PFAS). Previously PFAS analysis was undertaken on groundwater samples collected from three groundwater monitoring wells on the site (RCA 2016). No detectable concentrations of PFAS were reported in the samples analysed (i.e. above the detection limit of 0.00001 mg/L). A copy of this report was included as Appendix 7 of the Response to Submissions (Kleinfelder 2016). The absence of detectable concentrations in groundwater conforms with contamination plume modelling (refer Figure F49, p210) undertaken as part of the Stage 2B Environmental Investigation Report for the RAAF Base, Williamtown by AECOM (dated 30 June 2016) that shows groundwater over the majority of the site is unlikely to contain detectable concentrations of PFAS.

No historical investigation of the presence of PFAS in soil (from an off-site source) have been undertaken at the site. Due to the site's distance (approximately 1.4 km southwest to its closest boundary) from the Williamtown RAAF, it is considered unlikely that detectable concentrations from airborne deposition would be present in soil. Furthermore, the site is upgradient of surface water flows. However, if PFAS were present, they would be expected to be present within shallow surface soils, particularly due to the higher organic content present within this portion of the soil profile.

2. OBJECTIVES

The objectives of this investigation were to:

- Determine if detectable PFAS concentrations were present within the shallow surface soils of the proposed quarry disturbance area.
- If concentrations are present, determine if there is a potential for increased PFAS exposure to quarry employees and the community from the quarry and consequently if air monitoring for PFAS during quarrying is required.

3. SCOPE OF WORK

In order to achieve the stated objectives, Kleinfelder completed the following scope of works:

- Collected 22 soil samples (plus two quality assurance samples) from 10 locations across the proposed quarry disturbance area (S1-S10) targeting areas of both known past disturbance from mineral sand extraction or silica extraction and areas not known to be previously disturbed. The locations comprised a mix of vegetation cover, from no surface vegetation through to grass with no canopy and with full canopy.
- Soil samples were collected from both the surface layer and the base of the excavation generally around 0.7 m below surface. Excavation and sampling was conducted by manual excavation using shovels and trowels.
- Logged the nature of subsurface conditions encountered and samples collected as well as the coordinates of each location.
- Sixteen soil samples, plus one duplicate was submitted to NATA registered laboratory ALS Environmental Division Sydney (ALS) for analysis, with a triplicate (inter-laboratory duplicate) sample sent to Eurofins mgt, Sydney. Samples were analysed for a suite of 28 PFAS, including Perfluorooctane sulfonate (PFOS) and Perfluorooctanoic acid (PFOA).
- Undertook standard quality assurance and control procedures during the intrusive investigation, including the collection of rinsate, field blank and inter- and intra- laboratory duplicate samples.

4. SUMMARY OF FIELD WORKS

The assessment comprised a field investigation undertaken on 7 December 2016. A summary of the field activities undertaken is provided in **Table 3.1** below. The site location and sample locations are shown on the attached **Figure 1** and **Figure 2 (Attachment 1)**, soil borehole logs are presented as **Attachment 3**.

Table 3.1: Rationale and Subsurface Profile Encountered

Sample Location	Rationale	Planned Depth	Depth Advanced (m)	Comments
S01	Former disturbance area, grass vegetation cover	Into sands below organic topsoil layer (<1m)	0.5	Defined topsoil layer to 220 mm, underlain by white sand.
S02, S06, S07, S09	Past disturbance areas associated with heavy mineral sand mining, now regenerating woodland. S06 likely to have been cleared but not mined.	Into sands below organic topsoil layer (<1m)	Varies, to maximum depth of 0.65	Sandy topsoil layer underlain by cleaner sands. Sites S02 and S06 contained red sands beneath topsoil rather than the yellow to white sands that were in other sites.
S04	Former disturbance area from silica sand extraction, no surface vegetation.	<1m	0.7	Layering of sands evident from past wind or water erosion with occasional pieces of weathered coffee rock – note coffee rock located upslope also.
S03, S05, S08, S10	Areas with limited or no evidence of past disturbance and clearing.	<1m	Varies, to maximum depth of 0.75	Typical profiles for area consisting of 300 mm topsoil underlain by cleaner white to yellow sands. S08 had higher apparent moisture content.

The samples analysed were located above the maximum predicted groundwater level of 2.5-4.0 m AHD across the site (defined as part of the EIS and Response to Submissions), and are not subject to offsite surface water runoff. The elevation of samples relative to maximum predicted groundwater is shown by **Table 3.2**, all sample locations are more than 1.5 m above the depth of possible groundwater saturation.

Table 3.2: Sample locations and elevations relative the water table

Sample Site	Approximate Surface Elevation	Approximate Predicted Maximum Groundwater Level	Maximum Borehole Depth
S01	6.25 m AHD	2.5-3.0 m AHD	5.75 m AHD
S02	10.0 m AHD	3.5-4.0 m AHD	9.57 m AHD
S03	19.0 m AHD	3.0-3.5 m AHD	18.5 m AHD
S04	8.0 m AHD	3.0-3.5 m AHD	7.25 m AHD
S05	11.0 m AHD	3.0 m AHD	10.25 m AHD
S06	9.25 m AHD	3.5-4.0 m AHD	8.6 m AHD
S07	9.5 m AHD	4.0 m AHD	8.95 m AHD
S08	7.25m AHD	4.0 m AHD	6.6 m AHD
S09	14.75 m AHD	4.0 m AHD	14.05 m AHD
S10	6.5 m AHD	4.0 m AHD	5.75 m AHD

5. RESULTS

5.1 SUBSURFACE CONDITIONS

The site is generally characterised by a fine-medium to medium grained sandy topsoil layer containing fine charcoal, organic material and frequent roots to a depth of approximately 0.3 m below surface. The degree of roots decreases with depth as does the proportion of organic material or silts, resulting in yellow through to white sands. Some areas appear to contain

red/brown staining, typical of an organic tannin staining (e.g. weathered coffee rock) and/or iron staining.

Areas that were subject to past disturbance typically showed less organic material in the upper 300 mm of topsoil than those sites that had not been previously subject to heavy mineral sand mining.

Moisture content was characterised by a wetter surface layer of 4 to 6 % moisture (depending on surface cover) decreasing with depth to 1.4 to 3 % moisture at the base of excavations. One site showed levels notably higher in the surface layer at almost 16% moisture.

Logs of subsurface conditions are included within **Attachment 3**.

5.2 ENVIRONMENTAL SOIL ASSESSMENT CRITERIA

For the purposes of this investigation screening criteria were adopted for selected PFAS (PFOS, PFOA and perfluorohexane sulfonate [PFHxS]) for human health and ecological receptors for both onsite (commercial/industrial) and offsite (residential) scenarios. There are currently no New South Wales based soil screening criteria for PFAS. As such the following guidance documents were reviewed:

- The Western Australian Department of Environment Regulation (DER) developed the *Interim Guideline on the Assessment and Management of PFAS Contaminated Sites Guidelines* (Revision 2.1 released January 2017). These guidelines provide the following provisional levels (subject to any changes published by enHealth) for the protection of human health in residential and commercial/industrial scenarios.
- Commonwealth Department of the Environment and Energy have released a draft *Commonwealth Environmental Management Guidance on Perfluorooctane Sulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA)*, dated October 2016. Table 2 references the Canadian Federal Environmental Quality Guidelines and provides criteria that are applicable for when no groundwater assessment is conducted. These criteria take into account the potential for leaching from soil to groundwater and potential for bioaccumulation to secondary consumers (e.g. plant or invertebrate eating wildlife).

The values adopted are presented in **Table 5.1**.

Table 4.1: Adopted PFAS Screening Criteria

Compound	Human Health		Ecological	
	Residential	Commercial/Industrial	Residential	Commercial/Industrial
PFOA	40 mg/kg	1,000 mg/kg	NE	NE
PFOS	NE	NE	0.01 mg/kg	0.130 mg/kg
Sum of PFOS+PFHxS	4 mg/kg	100 mg/kg	NE	NE

NE – Not established

5.3 SOIL ANALYTICAL RESULTS

Of the 16 samples submitted for laboratory analysis, 11 samples comprised upper topsoil / organic layer soil and five samples of the underlying sands.

Soil analytical results are provided in the following attachments:

- **Attachment 2** - **Table 1** (attached) – Soil Analytical Results.

- **Attachment 2 - Table 2 – 3** (attached) – Quality Control Sample Results.
- **Attachment 4** – Chain of Custody Documentation and Laboratory Certificates.

No measureable concentrations of PFAS were detected in the samples analysed (i.e. all results were below the laboratory limit of reporting [LOR], which ranges from 0.0002 mg/kg and 0.0005 mg/kg). Furthermore, the laboratory LOR was less than the adopted screening values.

5.4 QUALITY ASSURANCE / QUALITY CONTROL

Kleinfelder has undertaken a review of field and laboratory quality control sample data collected during the project including:

- Intra-laboratory duplicate and inter-laboratory triplicate sample sets.
- One rinsate sample.
- One trip blank sample.
- Laboratory duplicates, method blanks, matrix spikes, laboratory control samples.

Laboratory analysis included extensive review of analysis results and samples resulting in two amendments to the laboratory reports. Based on a review of the quality control data by both Kleinfelder and the laboratory Kleinfelder considers that there is an acceptable degree of confidence in the data.

6. CONCLUSIONS & RECOMMENDATIONS

Kleinfelder completed a soil assessment of the proposed WSS sand quarry with the objective determining if concentrations of PFAS were present within the shallow soils of the proposed quarry footprint. Of the 16 samples analysed, no measureable concentrations of PFAS were detected.

On the basis of no detection of PFAS within shallow soil samples from the quarry disturbance area or groundwater on the subject land (RCA, 2016), an increase in exposure to quarry employees or the community is unlikely and further monitoring of PFAS within dust potentially generated by future quarry operations is not considered warranted.

7. LIMITATIONS

The conclusions presented in this report are relevant to the conditions of the site and the state of legislation currently enacted as at the date of this report.

Findings and conclusions are made assuming that the soil, groundwater, geological and chemical conditions detailed within this Report are accurate and remain applicable to the site at the time of writing. No other warranties are made or intended.

Kleinfelder has used a degree of skill and care ordinarily exercised by reputable members of our profession practicing in the same or similar locality.

Kleinfelder does not make any representation or warranty that the conclusions in this report will be applicable in the future as there may be changes in the condition of the site, applicable legislation or other factors that would affect the conclusions contained in this report.

This report has been prepared exclusively for use by Williamtown Sand Syndicate Pty Ltd. This report cannot be reproduced without the written authorisation of Kleinfelder Australia Pty Ltd and then can only be reproduced in its entirety.

If you require additional information or clarification, please contact the undersigned at (02) 4949 5200.

Sincerely,

Kleinfelder Australia Pty Ltd

Jonathan Berry

Senior Environmental Advisor

8. REFERENCES

- Commonwealth Department of the Environment and Energy have released a draft Commonwealth Environmental Management Guidance on Perfluorooctane Sulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA), dated October 2016.
- Western Australian Department of Env (DER) developed the *Interim Guideline on the Assessment and Management of PFAS Contaminated Sites Guidelines (dated February 2016).*
- RCA 2016, Groundwater Assessment, Cabbage Tree Road, Williamtown. Prepared for Williamtown Sand Syndicate Pty Limited by RCA Australia. Included as Appendix 7 of the Reponse to Submissions dated November 2016 by Kleinfelder Australia Pty Ltd.
- Kleinfelder 2016, Response to Submissions, Cabbage Tree Road Sand Quarry (SSD 13_6125), 398 Cabbage Tree Road, Williamtown, NSW. Prepared for Williamtown Sand Syndicate Pty Limited.

9. ATTACHMENTS

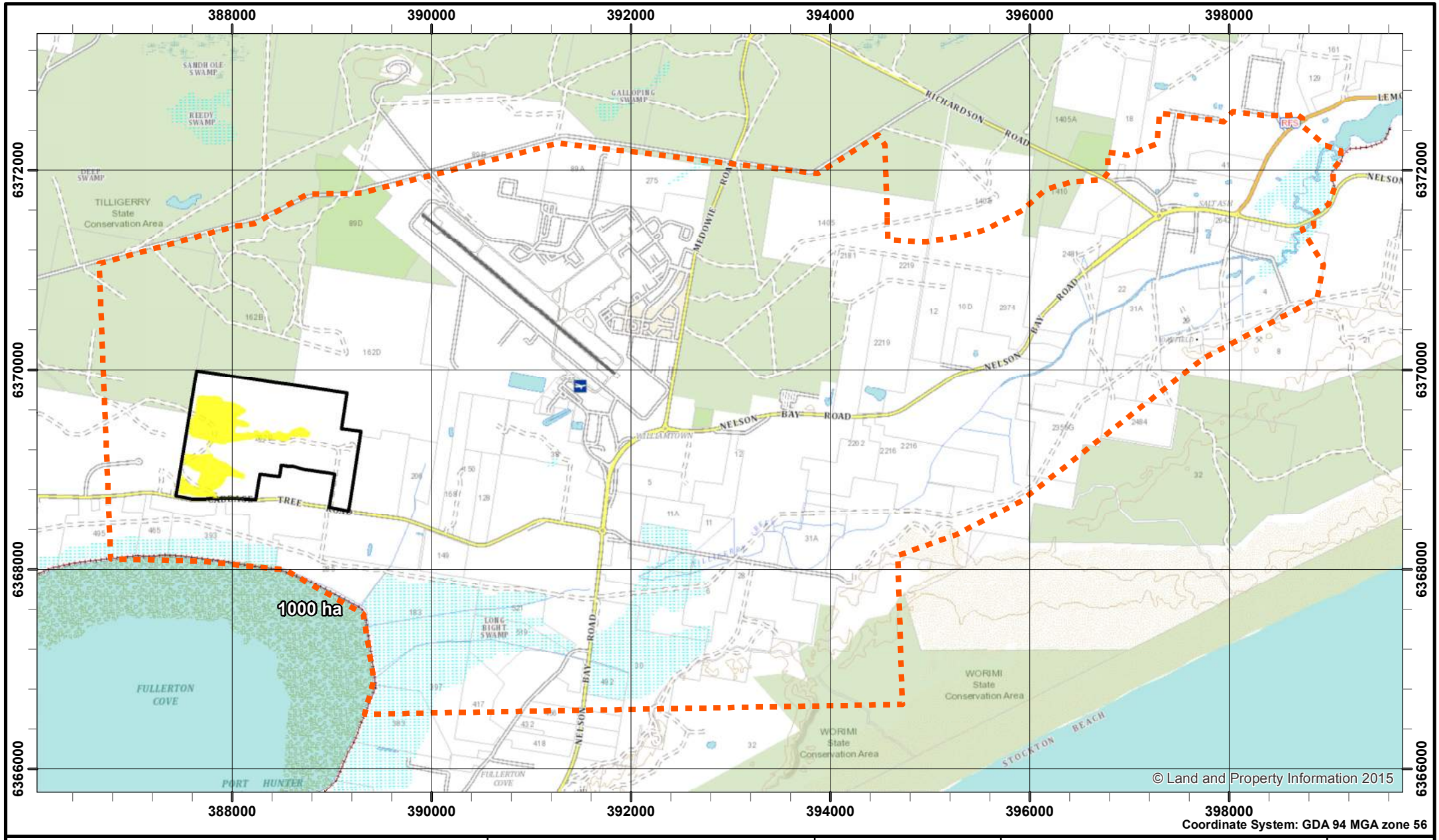
Attachment 1: Figures

Attachment 2: Tables

Attachment 3: Borehole Logs

Attachment 4: Laboratory Certificates

ATTACHMENT 1: FIGURES



Coordinate System: GDA 94 MGA zone 56

Legend

- Subject Land
- Quarry Project Area
- Williamtown Investigation Area (NSW EPA, October 2015)

Metres

0 250 500 1,000 1,500 2,000 2,500

N

KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com

PROJECT REFERENCE: 20170448

DATE DRAWN: 2/15/2017 09:19 Version 1

DRAWN BY: BDeane

DATA SOURCE:
NSW Land and Property Information - 2011
NSW Environment Protection Authority - 2015
nearmap - 2016

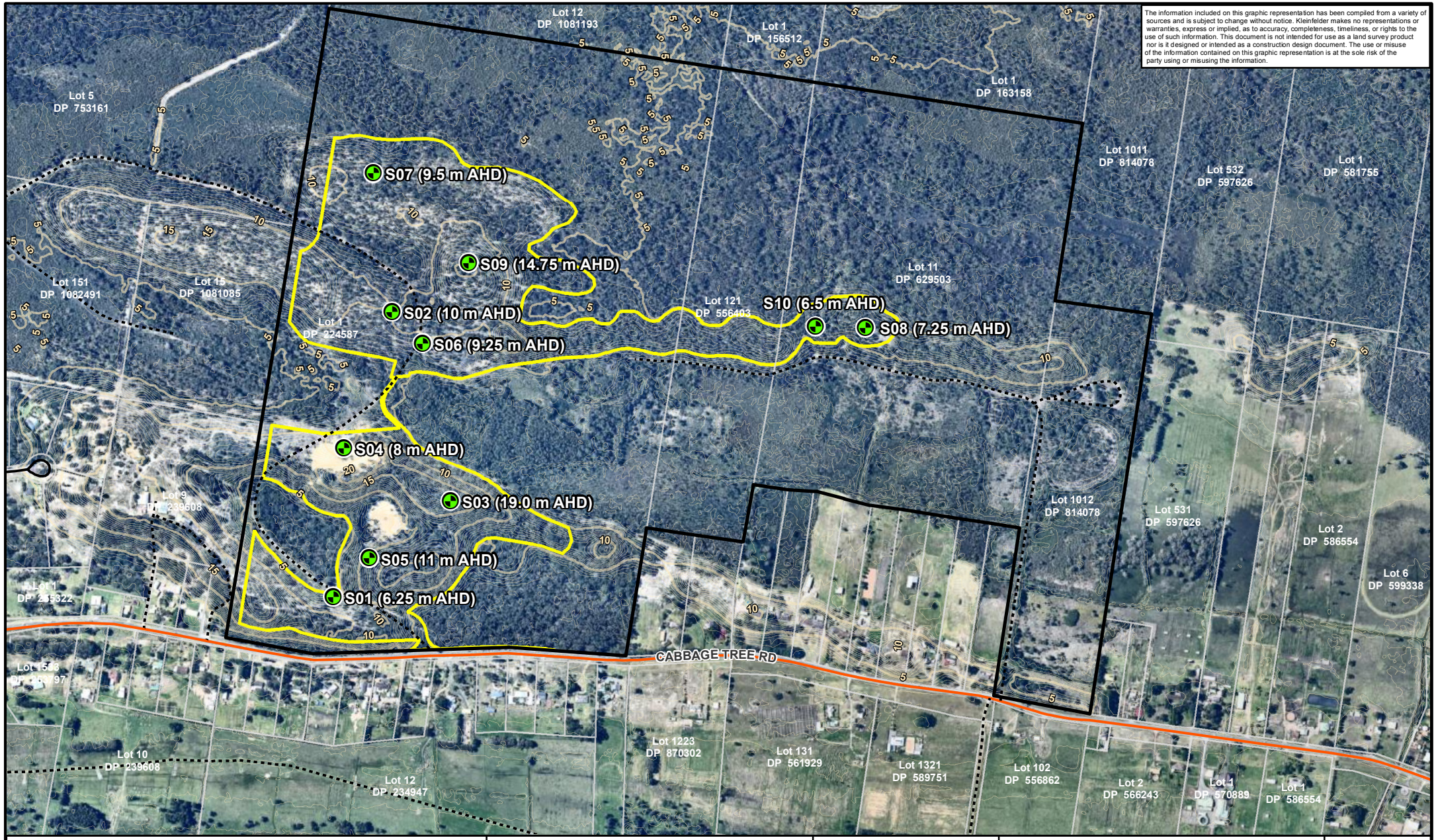
Williamtown Investigation Area

Williamtown Sand Syndicate
Proposed Sand Quarry
Cabbage Tree Road, Williamtown

FIGURE:

1

L:\GIS FOLDER\00 CLIENT FILES\126863_TrusteeForWSS_UnitTrust\20170448_Williamtown\Mapping\20170448_PFAS_Fig01_WilliamtownInvestigationArea.mxd



Legend

- Subject Land Boundary
- Quarry Project Area
- Lot Boundaries (LPI)
- PFAS Sampling Locations
- Arterial Road
- Local Road
- Track
- Major Contours (5m)
- Minor Contours (0.5m)

Metres
0 50 100 200 300 400 500
N

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PROJECT REFERENCE: 20170448
DATE DRAWN: 2/15/2017 12:01 Version 1
DRAWN BY: BDeane
DATA SOURCE:
LPI - 2016
Nearmap - 2016

PFAS Sampling Locations

Williamtown Sand Syndicate
Proposed Sand Quarry
Cabbage Tree Road, Williamtown

FIGURE:
2

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ATTACHMENT 2: TABLES

Table 1
Soil Analytical Data - Per- and Poly-Fluorinated Alkyl Substances
Cabbage Tree Road Sand Quarry
398 Cabbage Tree Road
Williamtown

Analyte			Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carboxylic Acids										
			Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonate (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)	Perfluorodecanoic acid (PFDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluorotetradecanoic acid (PFTeDA)
LOR			0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Human Health-based Screening Level: Residential[1]			--	--	--	--	--	--	--	--	--	--	**40**	--	--	--	--	--	--
Human Health-based Screening Level: Comm./Industrial[1]							--						**100**						
Ecological Screening Level - Residential & Parkland[2]			--	--	--	--	**0.01**	--	--	--	--	--	--	--	--	--	--	--	--
Ecological Screening Level - Residential & Parkland[2]			--	--	--	--	**0.13**	--	--	--	--	--	--	--	--	--	--	--	--
Sample Name	Sample Date	Depth (mm)																	
S1/1	07-Dec-16	0 - 50	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005
S2/1	17-Dec-16	0 - 50	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005
S2/2	07-Dec-16	570 - 630	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005
S3/1	07-Dec-16	0 - 50	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005
S4/1	07-Dec-16	0 - 50	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005
S4/2	07-Dec-16	400 - 500	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005
S5/1	17-Dec-16	0 - 50	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005
S5/1A	07-Dec-16	240 - 290	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005
S6/1	07-Dec-16	0 - 50	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005
S7/1	07-Dec-16	0 - 50	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005
S7/2	17-Dec-16	500 - 550	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005
S8/1	07-Dec-16	0 - 50	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005
S8/2	07-Dec-16	400 - 500	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005
S9/1	17-Dec-16	0 - 20	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005
S9/2	07-Dec-16	650 - 700	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005
S10/1	07-Dec-16	0 - 50	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005

Notes:
< - Less than laboratory limit of reporting
mg/kg - Milligrams per kilogram
"--" - Guideline value not established

Criteria:
1. *Interim Guideline on the Assessment and Management of Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS)*, Contaminated Sites Guidelines, WA Department of Environmental Regulation, January 2017
2. Environment Canada, 2015, F*ederal Environmental Quality Guidelines: Perfluorooctane Sulfonate (PFOS)*, National Guidelines and Standards Office, Gatineau, Quebec. Referenced in *Commonwealth Environmental Management Guidance on Perfluorooctane Sulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA*), dated October 2016. Values take into account water transport.

Table 1
Soil Analytical Data - Per- and Poly-Fluorinated Alkyl Substances
Cabbage Tree Road Sand Quarry
398 Cabbage Tree Road
Williamtown

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 (MeFOSE)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	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			0.0002	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.0002
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Human Health-based Screening Level: Residential[1]			--	--	--	--	--	--	--	--	--	--	--	**4.0**	--	--
Human Health-based Screening Level: Comm./Industrial[1]														**100**		
Ecological Screening Level - Residential & Parkland[2]			--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ecological Screening Level - Residential & Parkland[2]			--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sample Name	Sample Date	Depth (mm)														
S1/1	07-Dec-16	0 - 50	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002
S2/1	17-Dec-16	0 - 50	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002
S2/2	07-Dec-16	570 - 630	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002
S3/1	07-Dec-16	0 - 50	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002
S4/1	07-Dec-16	0 - 50	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002
S4/2	07-Dec-16	400 - 500	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002
S5/1	17-Dec-16	0 - 50	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002
S5/1A	07-Dec-16	240 - 290	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002
S6/1	07-Dec-16	0 - 50	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002
S7/1	07-Dec-16	0 - 50	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002
S7/2	17-Dec-16	500 - 550	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002
S8/1	07-Dec-16	0 - 50	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002
S8/2	07-Dec-16	400 - 500	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002
S9/1	17-Dec-16	0 - 20	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002
S9/2	07-Dec-16	650 - 700	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002
S10/1	07-Dec-16	0 - 50	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002

Notes:
< - Less than laboratory limit of reporting
mg/kg - Milligrams per kilogram
"--" - Guideline value not established

Criteria:
1. *Interim Guideline on the Assessment and Management of Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS)*, Contaminated Sites Guidelines, WA Department of Environmental Regulation, January 2017
2. Environment Canada, 2015, F*ederal Environmental Quality Guidelines: Perfluorooctane Sulfonate (PFOS)*, National Guidelines and Standards Office, Gatineau, Quebec. Referenced in *Commonwealth Environmental Management Guidance on Perfluorooctane Sulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA*), dated October 2016. Values take into account water transport.

Table 2
Soil Analytical Data - Quality Control Sample Analysis - Per- and Poly-Fluorinated Alkyl Substances
Cabbage Tree Road Sand Quarry
398 Cabbage Tree Road
Williamtown

Analyte			Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carboxylic Acids										
			Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonate (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)	Perfluorodecanoic acid (PFDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluorotetradecanoic acid (PFTeDA)
LOR			0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample Name	Sample Date	QC Sample Type																	
S10/1	07-Dec-16	Primary	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005
QA01	07-Dec-16	Duplicate	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005
Relative Percentage Difference			NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
S10/1	07-Dec-16	Primary	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005
QA02	07-Dec-16	Duplicate	< 0.005	-	< 0.005	-	-	-	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Relative Percentage Difference			NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC

Notes:
< - Less than laboratory limit of reporting
"-" - Not analysed
NC - Not calculated
mg/kg - Milligrams per kilogram

Table 2
Soil Analytical Data - Quality Control Sample Analysis - Per- and Poly-Fluorinated Alkyl Substances
Cabbage Tree Road Sand Quarry
398 Cabbage Tree Road
Williamtown

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 (MeFOSE)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	Sum of PFAS (WADER List)	Sum of PFAS
LOR			0.0002	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.0002
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample Name	Sample Date	QC Sample Type														
S10/1	07-Dec-16	Primary	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002
QA01	07-Dec-16	Duplicate	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002
Relative Percentage Difference			NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
S10/1	07-Dec-16	Primary	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002
QA02	07-Dec-16	Duplicate	< 0.01	< 0.01	< 0.01	-	-	-	-	< 0.005	< 0.01	< 0.005	-	-	-	-
Relative Percentage Difference			NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC

Notes:
< - Less than laboratory limit of reporting
"-" - Not analysed
NC - Not calculated
mg/kg - Milligrams per kilogram

Table 3
Quality Control Sample Analysis - Per- and Poly-Fluorinated Alkyl Substances
Cabbage Tree Road Sand Quarry
398 Cabbage Tree Road
Williamtown

Analyte			Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carboxylic Acids										
			Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonate (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)	Perfluorodecanoic acid (PFDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluorotetradecanoic acid (PFTeDA)
LOR			0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005
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
Sample Name	Sample Date	QC Sample Type																	
BLANK	07-Dec-16	Blank	< 0.02	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.1	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.05
RINSATE	07-Dec-16	Rinsate	< 0.02	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.1	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.05

Notes:
< - Less than laboratory limit of reporting
µg/L - Micrograms per litre

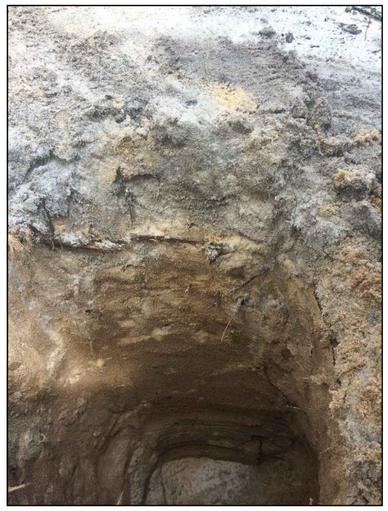
Table 3
Quality Control Sample Analysis - Per- and Poly-Fluorinated Alkyl Substances
Cabbage Tree Road Sand Quarry
398 Cabbage Tree Road
Williamtown

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 (MeFOSE)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	Sum of PFAS (WADER List)	Sum of PFAS
LOR			0.0002	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.0002
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
Sample Name	Sample Date	QC Sample Type														
BLANK	07-Dec-16	Blank	< 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
RINSATE	07-Dec-16	Rinsate	< 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

Notes:
< - Less than laboratory limit of reporting
µg/L - Micrograms per litre

ATTACHMENT 3: BOREHOLE LOGS

S01



S02

S03

S04

S05

S06

S08

S09

S10

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PROJECT:	20170448.001A
DATE DRAWN:	22.02.17
DRAWN BY:	LZ
CHECKED BY:	JB
FILE NAME:	photos.dwg

BORE PHOTOS

PROPOSED SAND QUARRY

NORTH OF CABBAGE TREE ROAD
WILLIAMTOWN, NSW

FIGURE

1

Date Begin - End:	07/12/16	**Drilling Company:**	N/A
Logged By:	J. Berry	**Drill Crew:**	N/A
Hor.-Vert. Datum:	MGA94 Zone 56 - mAHD	**Drilling Equipment:**	N/A
Plunge:	-90 degrees	**Drilling Method:**	Hand Excavation
Weather:	Not Available	**Bore Diameter:**	N/A mm.

BORING LOG S01

FIELD EXPLORATION

Northing: 6368822
Easting: 387656
Approximate Ground RL (mAHD): 6.25
Surface Condition: Grass

Approximate RL (mAHD)	Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
		Hand Excavation		S1/1				**TOPSOIL**: (sand) medium grained, brown/grey, high organic content, roots present
6.2								
	0.1							
6.1								
	0.2			S1/1A				
6.0								**SAND**: medium grained, white, roots present
	0.3							
5.9								
	0.4							
5.8				S1/2				
	0.5							
5.7								
	0.6							
5.6								
	0.7							
5.5								
	0.8							
5.4								
	0.9							
5.3								

The bore was terminated at approximately 0.5 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
This bore log was prepared in accordance with Australian Standards document AS1726 - Geotechnical Site Investigations. The bore location and elevation are approximate and were estimated by Kleinfelder.

KLEINFELDER
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PROJECT NO.:	20170448
DRAWN BY:	LZ
CHECKED BY:	JB
DATE:	21/2/17
REVISED:	-

BORING LOG S01

Williamtown Sand Quarry
North of Cabbage Tree Road
Williamtown, NSW

1

Date Begin - End:	07/12/16	**Drilling Company:**	N/A
Logged By:	J. Berry	**Drill Crew:**	N/A
Hor.-Vert. Datum:	MGA94 Zone 56 - mAHD	**Drilling Equipment:**	N/A
Plunge:	-90 degrees	**Drilling Method:**	Hand Excavation
Weather:	Not Available	**Bore Diameter:**	N/A mm.

BORING LOG S02

FIELD EXPLORATION

Northing: 6369391
Easting: 387774
Approximate Ground RL (mAHD): 10.00
Surface Condition: Sparse Vegetation

Approximate RL (mAHD)	Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
		Hand Excavation		S2/1				**TOPSOIL**: (sand) medium grained, brown/grey, roots present
9.9	0.1							**SAND**: medium grained, red/brown, roots decreasing with depth
9.8	0.2							
9.7	0.3							
9.6	0.4							
9.5	0.5							
9.4	0.6			S2/2				
9.3	0.7							
9.2	0.8							
9.1	0.9							

The bore was terminated at approximately 0.63 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
This bore log was prepared in accordance with Australian Standards document AS1726 - Geotechnical Site Investigations. The bore location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.:	20170448
DRAWN BY:	LZ
CHECKED BY:	JB
DATE:	21/2/17
REVISED:	-

BORING LOG S02

Williamtown Sand Quarry
North of Cabbage Tree Road
Williamtown, NSW

2

Date Begin - End:	07/12/16	**Drilling Company:**	N/A
Logged By:	J. Berry	**Drill Crew:**	N/A
Hor.-Vert. Datum:	MGA94 Zone 56 - mAHD	**Drilling Equipment:**	N/A
Plunge:	-90 degrees	**Drilling Method:**	Hand Excavation
Weather:	Not Available	**Bore Diameter:**	N/A mm.

BORING LOG S03

FIELD EXPLORATION

Northing: 6369013
Easting: 387890
Approximate Ground RL (mAHD): 19.00
Surface Condition: Sparse Vegetation

Approximate RL (mAHD)	Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
		Hand Excavation		S3/1				**TOPSOIL**: (sand) fine to medium grained, brown, high organic content, roots present
18.9	0.1							
18.8	0.2							
18.7	0.3							**SAND**: fine to medium grained, white, dry
18.6	0.4							
				S3/2				
18.5	0.5							
18.4	0.6							
18.3	0.7							
18.2	0.8							
18.1	0.9							

The bore was terminated at approximately 0.5 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
This bore log was prepared in accordance with Australian Standards document AS1726 - Geotechnical Site Investigations. The bore location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.:	20170448
DRAWN BY:	LZ
CHECKED BY:	JB
DATE:	21/2/17
REVISED:	-

BORING LOG S03

Williamtown Sand Quarry
North of Cabbage Tree Road
Williamtown, NSW

3

Date Begin - End:	07/12/16	**Drilling Company:**	N/A	**BORING LOG S04**
Logged By:	J. Berry	**Drill Crew:**	N/A	
Hor.-Vert. Datum:	MGA94 Zone 56 - mAHD	**Drilling Equipment:**	N/A	
Plunge:	-90 degrees	**Drilling Method:**	Hand Excavation	
Weather:	Not Available	**Bore Diameter:**	N/A mm.	

FIELD EXPLORATION

Northing: 6369118
Easting: 387677
Approximate Ground RL (mAHD): .75
Surface Condition: Bare Earth

Approximate RL (mAHD)	Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
		Hand Excavation		S4/1				**SAND**: medium grained, yellow
0.7								**SAND**: medium grained, layered brown/orange/yellow in 20-30mm layers
	0.1							
0.6								
	0.2							
0.5								
	0.3							
0.4								
	0.4			S4/2				
0.3								
	0.5							
0.2								
	0.6							
0.1								
	0.7							
0.0								isolated fragments of weathered coffee rock at 0.75m
	0.8							
-0.1								
	0.9							
-0.2								

The bore was terminated at approximately 0.75 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
This bore log was prepared in accordance with Australian Standards document AS1726 - Geotechnical Site Investigations. The bore location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.:	20170448
DRAWN BY:	LZ
CHECKED BY:	JB
DATE:	21/2/17
REVISED:	-

BORING LOG S04

Williamtown Sand Quarry
North of Cabbage Tree Road
Williamtown, NSW

4

Date Begin - End:	07/12/16	**Drilling Company:**	N/A
Logged By:	J. Berry	**Drill Crew:**	N/A
Hor.-Vert. Datum:	MGA94 Zone 56 - mAHD	**Drilling Equipment:**	N/A
Plunge:	-90 degrees	**Drilling Method:**	Hand Excavation
Weather:	Not Available	**Bore Diameter:**	N/A mm.

BORING LOG S05

FIELD EXPLORATION

Northing: 6368898
Easting: 387728
Approximate Ground RL (mAHD): .75
Surface Condition: Sparse Vegetation

Approximate RL (mAHD)	Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
		Hand Excavation		S5/1				**TOPSOIL**: (sand) medium grained, brown, high organic content, roots present
0.7								
	0.1							
0.6								
	0.2							
0.5				S5/1A				
	0.3							**SAND**: fine to medium grained, white
0.4								
	0.4							
0.3								
	0.5							
0.2								
	0.6							
0.1								
	0.7			S5/2				
0.0								
	0.8							
-0.1								
	0.9							
-0.2								

The bore was terminated at approximately 0.75 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
This bore log was prepared in accordance with Australian Standards document AS1726 - Geotechnical Site Investigations. The bore location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.:	20170448
DRAWN BY:	LZ
CHECKED BY:	JB
DATE:	21/2/17
REVISED:	-

BORING LOG S05

Williamtown Sand Quarry
North of Cabbage Tree Road
Williamtown, NSW

5

Date Begin - End:	07/12/16	**Drilling Company:**	N/A
Logged By:	J. Berry	**Drill Crew:**	N/A
Hor.-Vert. Datum:	MGA94 Zone 56 - mAHD	**Drilling Equipment:**	N/A
Plunge:	-90 degrees	**Drilling Method:**	Hand Excavation
Weather:	Not Available	**Bore Diameter:**	N/A mm.

BORING LOG S06

FIELD EXPLORATION

Northing: 6369328
Easting: 387835
Approximate Ground RL (mAHD): .65
Surface Condition: Sparse Vegetation

Approximate RL (mAHD)	Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
		Hand Excavation		S6/1				**TOPSOIL**: (sand) medium grained, brown/black, roots present
0.6	0.1							
0.5	0.2							
0.4	0.3							
0.3	0.4							
0.2	0.5			S6/1A				**SAND**: medium grained, red/brown, roots present
0.1	0.6			S6/2				
0.0	0.7							
-0.1	0.8							
-0.2	0.9							
-0.3								

The bore was terminated at approximately 0.65 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
This bore log was prepared in accordance with Australian Standards document AS1726 - Geotechnical Site Investigations. The bore location and elevation are approximate and were estimated by Kleinfelder.

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Bright People. Right Solutions.

PROJECT NO.:	20170448
DRAWN BY:	LZ
CHECKED BY:	JB
DATE:	21/2/17
REVISED:	-

BORING LOG S06

Williamtown Sand Quarry
North of Cabbage Tree Road
Williamtown, NSW

6

Date Begin - End:	07/12/16	**Drilling Company:**	N/A
Logged By:	J. Berry	**Drill Crew:**	N/A
Hor.-Vert. Datum:	MGA94 Zone 56 - mAHD	**Drilling Equipment:**	N/A
Plunge:	-90 degrees	**Drilling Method:**	Hand Excavation
Weather:	Not Available	**Bore Diameter:**	N/A mm.

BORING LOG S07

FIELD EXPLORATION

Northing: 6369668
Easting: 387736
Approximate Ground RL (mAHD): .50
Surface Condition: Sparse Vegetation

Approximate RL (mAHD)	Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
		Hand Excavation		S7/1				**TOPSOIL**: (sand) medium grained, grey/brown, roots present
								TOPSOIL: (sand) medium grained, yellow/brown, roots present
0.4	0.1							
0.3	0.2							
0.2	0.3							
								SAND: medium grained, yellow/brown
0.1	0.4							
0.0	0.5			S7/2				
-0.1	0.6							
-0.2	0.7							
-0.3	0.8							
-0.4	0.9							

The bore was terminated at approximately 0.55 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
This bore log was prepared in accordance with Australian Standards document AS1726 - Geotechnical Site Investigations. The bore location and elevation are approximate and were estimated by Kleinfelder.

KLEINFELDER
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PROJECT NO.:	20170448
DRAWN BY:	LZ
CHECKED BY:	JB
DATE:	21/2/17
REVISED:	-

BORING LOG S07

Williamtown Sand Quarry
North of Cabbage Tree Road
Williamtown, NSW

7

Date Begin - End:	07/12/16	**Drilling Company:**	N/A
Logged By:	J. Berry	**Drill Crew:**	N/A
Hor.-Vert. Datum:	MGA94 Zone 56 - mAHD	**Drilling Equipment:**	N/A
Plunge:	-90 degrees	**Drilling Method:**	Hand Excavation
Weather:	Not Available	**Bore Diameter:**	N/A mm.

BORING LOG S08

FIELD EXPLORATION

Northing: 6369359
Easting: 388721
Approximate Ground RL (mAHD): .65
Surface Condition: Sparse Vegetation

Approximate RL (mAHD)	Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
		Hand Excavation		S8/1				**TOPSOIL**: (sand) medium grained, dark grey/brown, roots present
0.6								
	0.1							
0.5								
	0.2							
0.4								
	0.3							**SAND**: medium grained, grey fading to white with depth
0.3								
	0.4			S8/2				
0.2								
	0.5							
0.1								
	0.6							
0.0								
	0.7							
-0.1								
	0.8							
-0.2								
	0.9							
-0.3								

The bore was terminated at approximately 0.65 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
This bore log was prepared in accordance with Australian Standards document AS1726 - Geotechnical Site Investigations. The bore location and elevation are approximate and were estimated by Kleinfelder.

KLEINFELDER
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PROJECT NO.:	20170448
DRAWN BY:	LZ
CHECKED BY:	JB
DATE:	21/2/17
REVISED:	-

BORING LOG S08

Williamtown Sand Quarry
North of Cabbage Tree Road
Williamtown, NSW

8

Date Begin - End:	07/12/16	**Drilling Company:**	N/A
Logged By:	J. Berry	**Drill Crew:**	N/A
Hor.-Vert. Datum:	MGA94 Zone 56 - mAHD	**Drilling Equipment:**	N/A
Plunge:	-90 degrees	**Drilling Method:**	Hand Excavation
Weather:	Not Available	**Bore Diameter:**	N/A mm.

BORING LOG S09

FIELD EXPLORATION

Northing: 6369489
Easting: 387927
Approximate Ground RL (mAHD): .70
Surface Condition: Sparse Vegetation

Approximate RL (mAHD)	Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
		Hand Excavation		S9/1				**TOPSOIL**: (sand) medium grained, grey, black organics/fine charcoal present
								SAND: medium grained, yellow, roots present
0.6	0.1							
0.5	0.2							
0.4	0.3							**SAND**: medium grained, yellow
0.3	0.4							
0.2	0.5							
0.1	0.6							
				S9/2				
0.0	0.7							
-0.1	0.8							
-0.2	0.9							

The bore was terminated at approximately 0.7 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
This bore log was prepared in accordance with Australian Standards document AS1726 - Geotechnical Site Investigations. The bore location and elevation are approximate and were estimated by Kleinfelder.

KLEINFELDER
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PROJECT NO.:	20170448
DRAWN BY:	LZ
CHECKED BY:	JB
DATE:	21/2/17
REVISED:	-

BORING LOG S09

Williamtown Sand Quarry
North of Cabbage Tree Road
Williamtown, NSW

9

Date Begin - End:	07/12/16	**Drilling Company:**	N/A
Logged By:	J. Berry	**Drill Crew:**	N/A
Hor.-Vert. Datum:	MGA94 Zone 56 - mAHD	**Drilling Equipment:**	N/A
Plunge:	-90 degrees	**Drilling Method:**	Hand Excavation
Weather:	Not Available	**Bore Diameter:**	N/A mm.

BORING LOG S10

FIELD EXPLORATION

Northing: 6369362
Easting: 388620
Approximate Ground RL (mAHD): .75
Surface Condition: Sparse Vegetation

Approximate RL (mAHD)	Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
		Hand Excavation		S10/1				**TOPSOIL**: (sand) medium grained, grey/brown, roots present
0.7								
	0.1							
0.6								
	0.2							
0.5								**SAND**: medium grained, grey, relatively high moisture content
	0.3							
0.4								
	0.4							
0.3								
	0.5							
0.2								
	0.6							
0.1								
	0.7			S10/2				
0.0								
	0.8							
-0.1								
	0.9							
-0.2								

The bore was terminated at approximately 0.75 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
This bore log was prepared in accordance with Australian Standards document AS1726 - Geotechnical Site Investigations. The bore location and elevation are approximate and were estimated by Kleinfelder.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	20170448
DRAWN BY:	LZ
CHECKED BY:	JB
DATE:	21/2/17
REVISED:	-

BORING LOG S10

Williamtown Sand Quarry
North of Cabbage Tree Road
Williamtown, NSW

10

ATTACHMENT 4: LABORATORY CERTIFICATES

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1628213**	Page	: 1 of 11
Amendment	: **2**		
Client	: **KLEINFELDER AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR JONATHAN BERRY	Contact	: Shirley LeCornu
Address	: LEVEL 1, 95 COVENTRY STREET SOUTH MELBOURNE VIC, AUSTRALIA 3205	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9907 6000	Telephone	: +61-3-8549 9630
Project	: 20170448	Date Samples Received	: 08-Dec-2016 16:08
Order number	: WSS20170448	Date Analysis Commenced	: 12-Dec-2016
C-O-C number	: ----	Issue Date	: 16-Feb-2017 15:08
Sampler	: JONATHAN BERRY		
Site	: ----		
Quote number	: EN/075/16		
No. of samples received	: 28		
No. of samples analysed	: 15		

ilac-MRA NATA
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 Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Gaston Allende	R&D Chemist	Sydney Organics, Smithfield, NSW
Lana Nguyen	Senior LCMS Chemist	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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 no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Amendment (08/02/2017): This report has been amended following changes to the analytical data reported. The quality system is being utilised to resolve this issue. The specific data affected includes PFAS results for sample #15
- Amendment (16/02/2017): This report has been amended following changes to the analytical data reported for analysis EP231X.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	S1/1	S2/2	S3/1	S4/1	S4/2
			Client sampling date / time	07-Dec-2016 00:00	07-Dec-2016 00:00	07-Dec-2016 00:00	07-Dec-2016 00:00	07-Dec-2016 00:00
Compound	CAS Number	LOR	Unit	ES1628213-001	ES1628213-004	ES1628213-005	ES1628213-007	ES1628213-008
				Result	Result	Result	Result	Result
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	5.8	2.9	12.4	3.8	2.8
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	S1/1	S2/2	S3/1	S4/1	S4/2
			Client sampling date / time	07-Dec-2016 00:00	07-Dec-2016 00:00	07-Dec-2016 00:00	07-Dec-2016 00:00	07-Dec-2016 00:00
Compound	CAS Number	LOR	Unit	ES1628213-001	ES1628213-004	ES1628213-005	ES1628213-007	ES1628213-008
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	86.2	104	78.3	87.8	92.6

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	S5/1A	S6/1	S7/1	S8/1	S8/2
			Client sampling date / time	07-Dec-2016 00:00	07-Dec-2016 00:00	07-Dec-2016 00:00	07-Dec-2016 00:00	07-Dec-2016 00:00
Compound	CAS Number	LOR	Unit	ES1628213-010	ES1628213-012	ES1628213-015	ES1628213-017	ES1628213-018
				Result	Result	Result	Result	Result
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	2.8	2.4	4.8	15.8	2.6
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	S5/1A	S6/1	S7/1	S8/1	S8/2
			Client sampling date / time	07-Dec-2016 00:00	07-Dec-2016 00:00	07-Dec-2016 00:00	07-Dec-2016 00:00	07-Dec-2016 00:00
Compound	CAS Number	LOR	Unit	ES1628213-010	ES1628213-012	ES1628213-015	ES1628213-017	ES1628213-018
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	93.0	73.2	73.1	109	112

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	S9/2	S10/1	QA01	----	----
			Client sampling date / time	07-Dec-2016 00:00	07-Dec-2016 00:00	07-Dec-2016 00:00	----	----
Compound	CAS Number	LOR	Unit	ES1628213-020	ES1628213-021	ES1628213-023	--------	--------
				Result	Result	Result	----	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	1.4	12.1	8.3	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	S9/2	S10/1	QA01	----	----
			Client sampling date / time	07-Dec-2016 00:00	07-Dec-2016 00:00	07-Dec-2016 00:00	----	----
Compound	CAS Number	LOR	Unit	ES1628213-020	ES1628213-021	ES1628213-023	--------	--------
				Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	111	103	119	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	RINSATE	BLANK	----	----	----
			Client sampling date / time	07-Dec-2016 00:00	07-Dec-2016 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES1628213-027	ES1628213-028	--------	--------	--------
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	RINSATE	BLANK	----	----	----
			Client sampling date / time	07-Dec-2016 00:00	07-Dec-2016 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES1628213-027	ES1628213-028	--------	--------	--------
				Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	101	90.1	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	70	130

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	130

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1628213**	Page	: 1 of 13
Amendment	: **2**		
Client	: **KLEINFELDER AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR JONATHAN BERRY	Contact	: Shirley LeCornu
Address	: LEVEL 1, 95 COVENTRY STREET SOUTH MELBOURNE VIC, AUSTRALIA 3205	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9907 6000	Telephone	: +61-3-8549 9630
Project	: 20170448	Date Samples Received	: 08-Dec-2016
Order number	: WSS20170448	Date Analysis Commenced	: 12-Dec-2016
C-O-C number	: ----	Issue Date	: 17-Feb-2017
Sampler	: JONATHAN BERRY		
Site	: ----		
Quote number	: EN/075/16		
No. of samples received	: 28		
No. of samples analysed	: 15		

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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Gaston Allende	R&D Chemist	Sydney Organics, Smithfield, NSW
Lana Nguyen	Senior LCMS Chemist	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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 LC

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: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA055: Moisture Content (QC Lot: 688098)									
EB1629145-006	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	11.9	11.9	0.00	0% - 50%
ES1628156-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	11.1	13.6	20.2	0% - 50%
EA055: Moisture Content (QC Lot: 688099)									
ES1628213-007	S4/1	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	3.8	3.5	8.43	No Limit
ES1628213-023	QA01	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	8.3	7.4	11.7	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 685289)									
ES1628101-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0010	0.0011	15.2	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0277	0.0316	12.9	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0004	0.0003	31.4	No Limit
ES1628213-010	S5/1A	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 686916)									
EP1611712-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0007	0.0008	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 686916) - continued									
EP1611712-001	Anonymous	EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
ES1628213-005	S3/1	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 685289)									
ES1628101-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
ES1628213-010	S5/1A	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 686916)									
EP1611712-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 686916) - continued									
EP1611712-001	Anonymous	EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
ES1628213-005	S3/1	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 685289)									
ES1628101-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
ES1628213-010	S5/1A	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 686916)									

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 686916) - continued									
EP1611712-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
ES1628213-005	S3/1	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 685289)									
ES1628101-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
ES1628213-010	S5/1A	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 685289) - continued									
ES1628213-010	S5/1A	EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 686916)									
EP1611712-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
ES1628213-005	S3/1	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 695096)									
ES1628213-027	RINSATE	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 695096)									
ES1628213-027	RINSATE	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit

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 (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 695096)									
ES1628213-027	RINSATE	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 695096)									
ES1628213-027	RINSATE	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 695096)									
ES1628213-027	RINSATE	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	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: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 685289)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	114	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	75.8	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.1	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	91.9	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.8	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	66.2	54	125
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 686916)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	118	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	83.7	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	93.0	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.3	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.5	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	91.6	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 685289)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	76.1	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	105	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.1	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	93.0	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	98.3	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.9	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	100	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.7	62	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.6	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	74.5	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	71.0	59	129
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 686916)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	88.5	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	115	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	74.8	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.0	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	106	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.8	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.1	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	73.7	62	130

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 686916) - continued								
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.7	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	73.5	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	78.5	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 685289)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	71.7	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	78.0	65	126
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	79.0	64	126
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	88.7	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	61.1	58	125
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.0	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.9	55	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 686916)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.4	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	80.1	65	126
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	82.3	64	126
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	74.8	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	85.3	58	125
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	67.8	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	62.4	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 685289)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	99.3	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	113	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	76.3	62	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	111	60	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 686916)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	83.5	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	108	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	82.2	62	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	78.8	60	130

Sub-Matrix: **WATER**

Method Blank (MB) Report	Laboratory Control Spike (LCS) Report: Spike	Spike Recovery (%)	Recovery Limits (%)

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 695096)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.5 µg/L	80.2	70	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.5 µg/L	83.2	70	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.5 µg/L	94.2	70	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.5 µg/L	81.0	70	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.5 µg/L	93.6	70	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.5 µg/L	78.4	70	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 695096)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	2.5 µg/L	84.2	70	130
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.5 µg/L	83.6	70	130
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.5 µg/L	87.4	70	130
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.5 µg/L	89.2	70	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.5 µg/L	86.4	70	130
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.5 µg/L	88.0	70	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.5 µg/L	89.8	70	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.5 µg/L	90.2	70	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.5 µg/L	100	70	130
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.5 µg/L	74.8	70	130
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	1.25 µg/L	72.0	70	124
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 695096)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.5 µg/L	79.2	70	130
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	1.25 µg/L	72.6	70	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	1.25 µg/L	76.3	70	129
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	1.25 µg/L	80.7	70	129
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	1.25 µg/L	91.1	70	126
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.5 µg/L	82.4	70	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.5 µg/L	87.2	70	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 695096)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.5 µg/L	82.6	70	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.5 µg/L	92.8	70	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.5 µg/L	87.4	70	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.5 µg/L	78.8	70	130

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: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 685289)							
ES1628101-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	96.7	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	72.1	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	97.5	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	98.9	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	# Not Determined	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	58.4	50	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 686916)							
EP1611712-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	104	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	98.9	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	108	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	76.9	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	69.2	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	68.6	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 685289)							
ES1628101-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	75.6	30	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	107	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	103	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	103	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	84.3	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	90.6	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	111	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	73.8	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	76.5	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	78.8	30	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	49.6	30	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 686916)							
EP1611712-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	103	30	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	114	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	107	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	106	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	73.0	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	64.4	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	63.4	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	60.2	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	67.6	50	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 686916) - continued							
EP1611712-001	Anonymous	EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	60.8	30	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	68.6	30	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 685289)							
ES1628101-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	71.5	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	34.8	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	68.6	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.00312 mg/kg	32.9	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	46.4	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	101	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	109	30	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 686916)							
EP1611712-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	73.2	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	70.5	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	101	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.00312 mg/kg	93.1	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	75.6	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	66.3	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	64.6	30	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 685289)							
ES1628101-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	107	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	91.7	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	112	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	118	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 686916)							
EP1611712-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	98.4	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	91.3	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	61.3	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	72.6	50	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 695096)							
ES1628213-027	RINSATE	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.5 µg/L	93.6	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.5 µg/L	101	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.5 µg/L	93.4	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.5 µg/L	95.2	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.5 µg/L	85.4	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.5 µg/L	69.8	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 695096)							
ES1628213-027	RINSATE	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	2.5 µg/L	93.6	50	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.5 µg/L	99.0	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.5 µg/L	90.0	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.5 µg/L	94.8	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.5 µg/L	98.4	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.5 µg/L	85.2	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.5 µg/L	74.8	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.5 µg/L	72.2	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.5 µg/L	83.0	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.5 µg/L	75.4	50	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	1.25 µg/L	61.3	50	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 695096)							
ES1628213-027	RINSATE	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.5 µg/L	69.8	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	1.25 µg/L	64.3	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	1.25 µg/L	66.2	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	1.25 µg/L	77.2	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	1.25 µg/L	74.6	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.5 µg/L	68.6	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.5 µg/L	80.0	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 695096)							
ES1628213-027	RINSATE	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.5 µg/L	95.0	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.5 µg/L	94.6	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.5 µg/L	80.2	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.5 µg/L	75.8	50	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1628213**	Page	: 1 of 6
Amendment	: **2**		
Client	: **KLEINFELDER AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR JONATHAN BERRY	Telephone	: +61-3-8549 9630
Project	: 20170448	Date Samples Received	: 08-Dec-2016
Site	: ----	Issue Date	: 16-Feb-2017
Sampler	: JONATHAN BERRY	No. of samples received	: 28
Order number	: WSS20170448	No. of samples analysed	: 15

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	ES1628101--001	Anonymous	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

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: **SOIL**

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*
EA055: Moisture Content								
HDPE Soil Jar (EA055-103)								
S1/1,	S2/2,	**07-Dec-2016**	**----**	----	----	**12-Dec-2016**	21-Dec-2016	✓
S3/1,	S4/1,							
S4/2,	S5/1A,							
S6/1,	S7/1,							
S8/1,	S8/2,							
S9/2,	S10/1,							
QA01								
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X)								
S1/1,	S2/2,	**07-Dec-2016**	**14-Dec-2016**	05-Jun-2017	✓	**14-Dec-2016**	23-Jan-2017	✓
S3/1,	S4/1							
HDPE Soil Jar (EP231X)								
S4/2,	S5/1A,	**07-Dec-2016**	**15-Dec-2016**	05-Jun-2017	✓	**15-Dec-2016**	24-Jan-2017	✓
S6/1,	S7/1,							
S8/1,	S8/2,							
S9/2,	S10/1,							
QA01								

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X) S1/1, S2/2, S3/1, S4/1	**07-Dec-2016**	**14-Dec-2016**	05-Jun-2017	✓	**14-Dec-2016**	23-Jan-2017	✓
HDPE Soil Jar (EP231X) S4/2, S5/1A, S6/1, S7/1, S8/1, S8/2, S9/2, S10/1, QA01	**07-Dec-2016**	**15-Dec-2016**	05-Jun-2017	✓	**15-Dec-2016**	24-Jan-2017	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X) S1/1, S2/2, S3/1, S4/1	**07-Dec-2016**	**14-Dec-2016**	05-Jun-2017	✓	**14-Dec-2016**	23-Jan-2017	✓
HDPE Soil Jar (EP231X) S4/2, S5/1A, S6/1, S7/1, S8/1, S8/2, S9/2, S10/1, QA01	**07-Dec-2016**	**15-Dec-2016**	05-Jun-2017	✓	**15-Dec-2016**	24-Jan-2017	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X) S1/1, S2/2, S3/1, S4/1	**07-Dec-2016**	**14-Dec-2016**	05-Jun-2017	✓	**14-Dec-2016**	23-Jan-2017	✓
HDPE Soil Jar (EP231X) S4/2, S5/1A, S6/1, S7/1, S8/1, S8/2, S9/2, S10/1, QA01	**07-Dec-2016**	**15-Dec-2016**	05-Jun-2017	✓	**15-Dec-2016**	24-Jan-2017	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X) S1/1, S2/2, S3/1, S4/1	**07-Dec-2016**	**14-Dec-2016**	05-Jun-2017	✓	**14-Dec-2016**	23-Jan-2017	✓
HDPE Soil Jar (EP231X) S4/2, S5/1A, S6/1, S7/1, S8/1, S8/2, S9/2, S10/1, QA01	**07-Dec-2016**	**15-Dec-2016**	05-Jun-2017	✓	**15-Dec-2016**	24-Jan-2017	✓

Matrix: **WATER**

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

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
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X)								
RINSATE,	BLANK	**07-Dec-2016**	**----**	----	----	**16-Dec-2016**	05-Jun-2017	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X)								
RINSATE,	BLANK	**07-Dec-2016**	**----**	----	----	**16-Dec-2016**	05-Jun-2017	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X)								
RINSATE,	BLANK	**07-Dec-2016**	**----**	----	----	**16-Dec-2016**	05-Jun-2017	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X)								
RINSATE,	BLANK	**07-Dec-2016**	**----**	----	----	**16-Dec-2016**	05-Jun-2017	✓
EP231P: PFAS Sums								
HDPE Soil Jar (EP231X)								
RINSATE,	BLANK	**07-Dec-2016**	**----**	----	----	**16-Dec-2016**	05-Jun-2017	✓

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: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055-103	4	38	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	4	37	**10.81**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	37	**5.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	37	**5.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	37	**5.41**	**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*	
Laboratory Duplicates (DUP)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	2	**50.00**	**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*
Moisture Content	EA055-103	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-House. A portion of soil is extracted with MTBE. The extract is taken to dryness, made up in mobile phase. Analysis is by LC/MSMS, ESI Negative Mode using MRM. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers.
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In house: Direct injection analysis of fresh waters after dilution (1:1) with methanol. Analysis by LC-Electrospray-MS-MS, Negative Mode using MRM. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Sample Extraction for PFAS	EP231-PR	SOIL	In house

KLEINFELDER AUSTRALIA PTY LTD

COC number:

KLEINFELDER
Bright People. Right Solutions.

Client:	SITE, COC AND CONTACT DATA				Laboratory:
Kleinfelder Australia Pty Ltd 95 Mitchell Road Cardiff NSW 2285 Phone: 02 4949 5200	Site Name:	WSS20170448	Sampler Name:	Jonathan Berry	ALS 277-289 Woodpark Road Smithfield NSW 2164 Phone: (02) 4014 2500
	QUOTE NUMBER	EN/075/15	Contact Number:	0421440139	
	Job No.:	20170448	Contact e-mail:	jberry@kleinfelder.com	
	Required TAT:	standard X	PM name (if not sampler):	Jonathan Berry	
	Data QA level:	LAB minimum unless specified:	PM e-mail:	jberry@kleinfelder.com	

CHAIN OF CUSTODY							Send Results to:
Relinquished by (print):	J Berry	Received by (print):	KH	Relinquished:		Received by:	Jonathan Berry
(sign)		(sign)		(sign)		(sign)	95 Mitchell Road
Date / Time:	4:05pm 8/12/16	Date / Time:	8/12/16 4.08pm	Date / Time:		Date / Time:	8/12/16 15:30
Notes:		Temp. (°C)	25.7	Notes:		Temp. (°C)	Cardiff, NSW 2285
		Notes:	ice bricks			Notes:	jberry@kleinfelder.com
			ice present / no ice seals intact / no seal				ice present / no ice seals intact / no seal
							Phone: 02 4949 5200

	Sample ID	Lab ID	Sample Point	Sample Type	Date	Start Depth	End Depth	Units	# Containers	EP231X	Comments
1	S1/1			Soil	7/12/2016				1	X	Analyse
2	S1/1A			Soil	7/12/2016				1		Hold
3	S2/1			Soil	7/12/2016				1		Hold
4	S2/2			Soil	7/12/2016				1	X	Analyse
5	S3/1			Soil	7/12/2016				1	X	Analyse
6	S3/2			Soil	7/12/2016				1		Hold
7	S4/1			Soil	7/12/2016				1	X	Analyse
8	S4/2			Soil	7/12/2016				1	X	Analyse
9	S5/1			Soil	7/12/2016				1		Hold
10	S5/1A			Soil	7/12/2016				1	X	Analyse
11	S5/2			Soil	7/12/2016				1		Hold
12	S6/1			Soil	7/12/2016				1	X	Analyse
13	S6/1A			Soil	7/12/2016				1		Hold
14	S6/2			Soil	7/12/2016				1		Hold
15	S7/1			Soil	7/12/2016				1	X	Analyse
16	S7/2			Soil	7/12/2016				1		Hold

Environmental Division
Sydney
Work Order Reference
ES1628213

Telephone : + 61-2-8784 8555

EMAILED

COC number: ES1628213

KLEINFELDER
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Client:	SITE, COC AND CONTACT DATA				Laboratory:
Kleinfelder Australia Pty Ltd	Site Name:	WSS20170448	Sampler Name:	Jonathan Berry	ALS
95 Mitchell Road	QUOTE NUMBER	EN/075/15	Contact Number:	0421440139	277-289 Woodpark Road
Cardiff	Job No.:	20170448	Contact e-mail:	jberry@kleinfelder.com	Smithfield
NSW 2285	Required TAT:	standard X	PM name (if not sampler):	Jonathan Berry	NSW 2164
Phone: 02 4949 5200	Data QA level:	LAB minimum unless specified.	PM e-mail:	jberry@kleinfelder.com	Phone: (02) 4014 2500

CHAIN OF CUSTODY							Send Results to:
Relinquished by (print):	J. Berry	Received by (print):		Relinquished:		Received by:	Jonathan Berry
(sign)		(sign)		(sign)		(sign)	95 Mitchell Road
Date / Time:	4:05pm 8/12/16	Date / Time:		Date / Time:		Date / Time:	8/12 19:30 Cardiff, NSW 2285
Notes:		Temp. (°C)		Notes:		Temp. (°C)	jberry@kleinfelder.com
		Notes:	ice present / no ice seals intact / no seal			Notes:	ice present / no ice seals intact / no seal Phone: 02 4949 5200

	Sample ID	Lab ID		Sample Point	Sample Type	Date	Start Depth	End Depth	Units	# Containers	EP231X																Comments
17	S8/1				Soil	7/12/2016				1	X																Analyse
18	S8/2				Soil	7/12/2016				1	X																Analyse
19	S9/1				Soil	7/12/2016				1																	Hold
20	S9/2				Soil	7/12/2016				1	X																Analyse
21	S10/1				Soil	7/12/2016				1	X																Analyse
22	S10/2				Soil	7/12/2016				1																	Hold
23	QA01				Soil	7/12/2016				1	X																Analyse
~~24~~	QA02				Soil	7/12/2016				1	X																SEND TO EUROFINS MGT PLEASE
24 ~~25~~	RINSATE				Soil	7/12/2016				1	X																Analyse
25 ~~26~~	BLANK				Soil	7/12/2016				1	X																Analyse
26 *	S1/2	Not		on		COC																					

EMAILED

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1701961**	Page	: 1 of 5
Amendment	: **1**		
Client	: **KLEINFELDER AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR JONATHAN BERRY	Contact	: Shirley LeCornu
Address	: LEVEL 1, 95 COVENTRY STREET SOUTH MELBOURNE VIC, AUSTRALIA 3205	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9907 6000	Telephone	: +61-3-8549 9630
Project	: 20170448	Date Samples Received	: 27-Jan-2017 17:35
Order number	: ----	Date Analysis Commenced	: 30-Jan-2017
C-O-C number	: ----	Issue Date	: 06-Feb-2017 11:57
Sampler	: JONATHAN BERRY		
Site	: WSS20170448		
Quote number	: EN/075/16		
No. of samples received	: 4		
No. of samples analysed	: 4		

Accreditation No. 825
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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.

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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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 no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Poor spike recovery for (EP231) due to matrix interferences.
- Amendment (2/2/2017): This report has been amended and re-released to allow the reporting of additional analytical data.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	S2/1	S5/1	S7/2	S9/1	----
			Client sampling date / time	17-Dec-2016 00:00	17-Dec-2016 00:00	17-Dec-2016 00:00	17-Dec-2016 00:00	----
Compound	CAS Number	LOR	Unit	ES1701961-001	ES1701961-002	ES1701961-003	ES1701961-004	--------
				Result	Result	Result	Result	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	3.2	7.1	4.0	2.9	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	S2/1	S5/1	S7/2	S9/1	----
			Client sampling date / time	17-Dec-2016 00:00	17-Dec-2016 00:00	17-Dec-2016 00:00	17-Dec-2016 00:00	----
Compound	CAS Number	LOR	Unit	ES1701961-001	ES1701961-002	ES1701961-003	ES1701961-004	--------
				Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	117	106	102	104	----

Surrogate Control Limits

Sub-Matrix: **SOIL**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	70	130

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1701961**	Page	: 1 of 9
Amendment	: **1**		
Client	: **KLEINFELDER AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR JONATHAN BERRY	Contact	: Shirley LeCornu
Address	: LEVEL 1, 95 COVENTRY STREET SOUTH MELBOURNE VIC, AUSTRALIA 3205	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9907 6000	Telephone	: +61-3-8549 9630
Project	: 20170448	Date Samples Received	: 27-Jan-2017
Order number	: ----	Date Analysis Commenced	: 30-Jan-2017
C-O-C number	: ----	Issue Date	: 06-Feb-2017
Sampler	: JONATHAN BERRY		
Site	: WSS20170448		
Quote number	: EN/075/16		
No. of samples received	: 4		
No. of samples analysed	: 4		

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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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (QC Lot: 736609)									
ES1701951-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	11.7	12.4	5.33	0% - 50%
ES1701968-006	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	6.9	6.9	0.00	No Limit
EA055: Moisture Content (QC Lot: 741939)									
ES1701961-004	S9/1	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	2.9	3.2	12.5	No Limit
EW1700440-007	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	10.0	9.8	2.56	0% - 50%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 735747)									
ES1701758-028	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0002	0.0003	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	0.0008	0.0009	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0362	0.0390	7.34	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	0.0023	0.0022	5.66	0% - 50%
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0417	0.0380	9.21	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0008	0.0009	12.6	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 740898)									
ES1701961-002	S5/1	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 735747)									
ES1701758-028	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0008	0.0008	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0057	0.0058	0.00	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0013	0.0011	15.1	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0031	0.0028	8.68	0% - 50%

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 735747) - continued									
ES1701758-028	Anonymous	EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 740898)									
ES1701961-002	S5/1	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 735747)									
ES1701758-028	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 740898)									
ES1701961-002	S5/1	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 740898) - continued									
ES1701961-002	S5/1	EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 735747)									
ES1701758-028	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 740898)									
ES1701961-002	S5/1	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	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: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 735747)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	73.6	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	117	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	97.2	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	115	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	105	54	125
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 740898)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	69.5	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	64.8	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.3	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	73.5	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	81.6	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.4	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 735747)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	88.7	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	66.2	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.8	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	97.2	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	112	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	110	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.1	62	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	115	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	100	59	129
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 740898)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	79.0	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	70.8	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	99.1	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	67.6	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.0	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.2	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	112	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	70.5	62	130

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 740898) - continued								
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	114	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.3	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	91.9	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 735747)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	68.1	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	108	65	126
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	90.9	64	126
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	93.7	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	80.1	58	125
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	121	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	102	55	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 740898)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	83.0	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	116	65	126
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	95.6	64	126
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	80.2	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	79.9	58	125
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	71.2	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	69.1	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 735747)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	121	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	112	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	105	62	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	99.2	60	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 740898)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	75.9	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	67.8	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	88.8	62	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	77.8	60	130

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: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 735747)							
ES1701758-028	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	84.9	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	71.0	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	# Not Determined	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	72.7	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	# Not Determined	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	56.9	50	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 740898)							
ES1701961-002	S5/1	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	120	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	77.3	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	121	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	102	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	99.4	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	107	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 735747)							
ES1701758-028	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	87.9	30	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	64.2	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	# Not Determined	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	62.1	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	65.8	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	# 39.4	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	59.9	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	# 36.8	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	62.7	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	61.4	30	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	34.6	30	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 740898)							
ES1701961-002	S5/1	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	72.6	30	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	67.0	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	110	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	62.6	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	117	50	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 740898) - continued							
ES1701961-002	S5/1	EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	74.1	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	52.3	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	85.2	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	101	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	62.8	30	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	31.0	30	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 735747)							
ES1701758-028	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	# 42.7	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	65.8	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	56.9	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.00312 mg/kg	33.1	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	# 29.4	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	61.0	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	58.0	30	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 740898)							
ES1701961-002	S5/1	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	90.9	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	54.7	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	75.6	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.00312 mg/kg	47.6	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	44.7	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	83.0	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	112	30	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 735747)							
ES1701758-028	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	102	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	104	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	69.4	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	61.9	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 740898)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 740898) - continued							
ES1701961-002	S5/1	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	71.8	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	55.1	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	67.9	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	62.0	50	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1701961**	Page	: 1 of 5
Amendment	: **1**		
Client	: **KLEINFELDER AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR JONATHAN BERRY	Telephone	: +61-3-8549 9630
Project	: 20170448	Date Samples Received	: 27-Jan-2017
Site	: WSS20170448	Issue Date	: 06-Feb-2017
Sampler	: JONATHAN BERRY	No. of samples received	: 4
Order number	: ----	No. of samples analysed	: 4

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	ES1701758--028	Anonymous	**Perfluorohexane sulfonic acid (PFHxS)**	355-46-4	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231A: Perfluoroalkyl Sulfonic Acids	ES1701758--028	Anonymous	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231B: Perfluoroalkyl Carboxylic Acids	ES1701758--028	Anonymous	**Perfluorohexanoic acid (PFHxA)**	307-24-4	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231B: Perfluoroalkyl Carboxylic Acids	ES1701758--028	Anonymous	**Perfluorononanoic acid (PFNA)**	375-95-1	39.4 %	50-130%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids	ES1701758--028	Anonymous	**Perfluoroundecanoic acid (PFUnDA)**	2058-94-8	36.8 %	50-130%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	ES1701758--028	Anonymous	**Perfluorooctane sulfonamide (FOSA)**	754-91-6	42.7 %	50-130%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	ES1701758--028	Anonymous	**N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)**	1691-99-2	29.4 %	30-130%	**Recovery less than lower data quality objective**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA055: Moisture Content						
HDPE Soil Jar S5/1, S7/2, S9/1	----	----	----	03-Feb-2017	31-Dec-2016	**34**
HDPE Soil Jar S2/1	----	----	----	30-Jan-2017	31-Dec-2016	**30**

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: **SOIL**

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

Matrix: **SOIL**

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
EA055: Moisture Content							
HDPE Soil Jar (EA055-103) S5/1, S7/2, S9/1	17-Dec-2016	----	----	----	03-Feb-2017	31-Dec-2016	×
HDPE Soil Jar (EA055-103) S2/1	17-Dec-2016	----	----	----	30-Jan-2017	31-Dec-2016	×
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X) S5/1, S7/2, S9/1	17-Dec-2016	03-Feb-2017	15-Jun-2017	✓	03-Feb-2017	15-Mar-2017	✓
HDPE Soil Jar (EP231X) S2/1	17-Dec-2016	30-Jan-2017	15-Jun-2017	✓	30-Jan-2017	11-Mar-2017	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X) S5/1, S7/2, S9/1	17-Dec-2016	03-Feb-2017	15-Jun-2017	✓	03-Feb-2017	15-Mar-2017	✓
HDPE Soil Jar (EP231X) S2/1	17-Dec-2016	30-Jan-2017	15-Jun-2017	✓	30-Jan-2017	11-Mar-2017	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X) S5/1, S7/2, S9/1	17-Dec-2016	03-Feb-2017	15-Jun-2017	✓	03-Feb-2017	15-Mar-2017	✓
HDPE Soil Jar (EP231X) S2/1	17-Dec-2016	30-Jan-2017	15-Jun-2017	✓	30-Jan-2017	11-Mar-2017	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X) S5/1, S7/2, S9/1	17-Dec-2016	03-Feb-2017	15-Jun-2017	✓	03-Feb-2017	15-Mar-2017	✓
HDPE Soil Jar (EP231X) S2/1	17-Dec-2016	30-Jan-2017	15-Jun-2017	✓	30-Jan-2017	11-Mar-2017	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X) S5/1, S7/2, S9/1	17-Dec-2016	03-Feb-2017	15-Jun-2017	✓	03-Feb-2017	15-Mar-2017	✓
HDPE Soil Jar (EP231X) S2/1	17-Dec-2016	30-Jan-2017	15-Jun-2017	✓	30-Jan-2017	11-Mar-2017	✓

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: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055-103	4	30	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	12	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	12	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	12	**16.67**	**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*
Moisture Content	EA055-103	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-House. A portion of soil is extracted with MTBE. The extract is taken to dryness, made up in mobile phase. Analysis is by LC/MSMS, ESI Negative Mode using MRM. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Sample Extraction for PFAS	EP231-PR	SOIL	In house

REBATCH

553-54.

KLEINFELDER AUSTRALIA PTY LTD

COC number:

KLEINFELDER Bright People. Right Solutions.

Client:	SITE, COC AND CONTACT DATA				Laboratory:
Kleinfelder Australia Pty Ltd 95 Mitchell Road Cardiff NSW 2285 Phone: 02 4949 5200	Site Name:	WSS20170448	Sampler Name:	Jonathan Berry	ALS 277-289 Woodpark Road Smithfield NSW 2164 Phone: (02) 4014 2500
	QUOTE NUMBER	EN/075/15	Contact Number:	0421440139	
	Job No.:	20170448	Contact e-mail:	jberry@kleinfelder.com	
	Required TAT:	standard X	PM name (if not sampler):	Jonathan Berry	
	Data QA level:	LAB minimum unless specified:	PM e-mail:	jberry@kleinfelder.com	

CHAIN OF CUSTODY

Relinquished by (print): J Berry	Received by (print): KH	Relinquished:	Received by:	Send Results to:
(sign)	(sign)	(sign)	(sign)	Jonathan Berry
Date / Time: 4:08 pm 8/12/16	Date / Time: 8/12/16 4.08pm	Date / Time:	Date / Time: 8/12/16 17:20	95 Mitchell Road
Notes:	Temp. (°C) 25.7	Notes:	Temp. (°C)	Cardiff, NSW 2285
	Notes: ice bricks		Notes:	jberry@kleinfelder.com
	ice present / no ice seals intact / no seal		ice present / no ice seals intact / no seal	Phone: 02 4949 5200

	Sample ID	Lab ID	Sample Point	Sample Type	Date	Start Depth	End Depth	Units	# Containers	EP231X	Comments
1	S1/1			Soil	7/12/2016				1	X	Analyse
2	S1/1A			Soil	7/12/2016				1		Hold
3	S2/1 (1)			Soil	7/12/2016				1	X	**Analyse**
4	S2/2			Soil	7/12/2016				1	X	Analyse
5	S3/1			Soil	7/12/2016				1	X	Analyse
6	S3/2			Soil	7/12/2016				1		Hold
7	S4/1			Soil	7/12/2016				1	X	Analyse
8	S4/2			Soil	7/12/2016				1	X	Analyse
9	S5/1 (2)			Soil	7/12/2016				1	X	**Analyse**
10	S5/1A			Soil	7/12/2016				1	X	Analyse
11	S5/2			Soil	7/12/2016				1		Hold
12	S6/1			Soil	7/12/2016				1	X	Analyse
13	S6/1A			Soil	7/12/2016				1		Hold
14	S6/2			Soil	7/12/2016				1		Hold
15	S7/1			Soil	7/12/2016				1	X	Analyse
16	S7/2 (3)			Soil	7/12/2016				1	X	**Analyse**

Environmental Division
Sydney
Work Order Reference
ES1701961

Telephone : + 61-2-8784 8555

Frame ALS
27-1-17 1735

EMAILED

KLEINFELDER AUSTRALIA PTY LTD

COC number: ES1628213

KLEINFELDER
Bright People. Right Solutions.

Client:	SITE, COC AND CONTACT DATA				Laboratory:
Kleinfelder Australia Pty Ltd	Site Name:	WSS20170448	Sampler Name:	Jonathan Berry	ALS
95 Mitchell Road	QUOTE NUMBER	EN/076/15	Contact Number:	0421440139	277-289 Woodpark Road
Cardiff	Job No.:	20170448	Contact e-mail:	jberry@kleinfelder.com	Smithfield
NSW 2285	Required TAT:	standard X	PM name (if not sampler):	Jonathan Berry	NSW 2164
Phone: 02 4949 5200	Data QA level:	LAB minimum unless specified:	PM e-mail:	jberry@kleinfelder.com	Phone: (02) 4014 2500

CHAIN OF CUSTODY

ished by (print): J. Berry	Received by (print):	Refinquished:	Received by:		Send Results to:
(sign)	(sign)	(sign)	(sign)		Jonathan Berry
Date / Time: 4:05pm	Date / Time:	Date / Time:	Date / Time: 8/12		95 Mitchell Road
Notes: 8/12/16	Temp. (°C)		Temp. (°C) 17.20		Cardiff, NSW 2285
	Notes: ice present / no ice seals intact / no seal	Notes:	Notes: ice present / no ice seals intact / no seal		jberry@kleinfelder.com
					Phone: 02 4949 5200

	Sample ID	Lab ID	Sample Point	Sample Type	Date	Start Depth	End Depth	Units	# Containers	EP231X	Comments
17	S8/1			Soil	7/12/2016				1	X	Analyse
18	S8/2			Soil	7/12/2016				1	X	Analyse
19	S9/1	(4)		Soil	7/12/2016				1	X	**Analyse**
20	S9/2			Soil	7/12/2016				1	X	Analyse
21	S10/1			Soil	7/12/2016				1	X	Analyse
22	S10/2			Soil	7/12/2016				1		Hold
23	QA01			Soil	7/12/2016				1	X	Analyse
24	QA02			Soil	7/12/2016				1	X	SEND TO EUROFINS MGT PLEASE
25	RINSATE			Soil	7/12/2016				1	X	Analyse
26	BLANK			Soil	7/12/2016				1	X	Analyse
*	S1/2	Not	on	COC							

Frank ALS
27-1-17 1735

EMAILED

Frank Ferraro

From: Loren Schiavon
Sent: Friday, 27 January 2017 5:35 PM
To: Frank Ferraro
Subject: FW: ES1628213 - Additional Testing
Attachments: ES1628213_COC_additionaltesting_2501.pdf

Hi Frank,

Can you please arrange this rebatch for Jonathan?

Thanks.

Kind regards

Loren Schiavon
Client Services Coordinator
Sydney

T +61 2 8784 8555 D +61 2 8784 8503
F +61 2 8784 8500
loren.schiavon@alsglobal.com
277-289 Woodpark
Smithfield, NSW, 2164

From: Jonathan Berry [mailto:JBerry@kleinfelder.com]
Sent: Friday, 27 January 2017 3:36 PM
To: Loren Schiavon <loren.schiavon@alsglobal.com>
Cc: Shirley LeCornu <shirley.lecornu@alsglobal.com>
Subject: FW: ES1628213 - Additional Testing

Hi Loren,

Can you please arrange for the extra testing identified below please.

Cheers
Jonathan

From: Jonathan Berry
Sent: Friday, 27 January 2017 3:18 PM

To: 'Shirley LeCornu' <shirley.lecornu@alsglobal.com>
Subject: ES1628213 - Additional Testing

Hi Shirley,

Can you please arrange for the additional testing highlighted in the attached, notably samples:

- S2/1
- S5/1
- S7/2
- S9/1

Thanks

Jonathan Berry BAppSc (Hons)
Senior Advisor
Environmental Management & Approvals

95 Mitchell Road, Cardiff, NSW 2285
t|: 1300 881 869 or +61 2 4949 5200
d|: +61 2 4949 5224
m|: 0421 440 139

Kleinfelder Australia Pty Ltd
ABN: 23 146 082 500
95 Mitchell Road
Cardiff, NSW 2285
T| 1300 881 869 **F|** 1300 881 035
www.kleinfelder.com/australia