

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. Williamstown Contamination Expert Panel Letter.

14 June 2017
Document No: NCA17R61130.

Williamtown Sand Syndicate Pty Ltd
C/O Arbus (Darren Williams)

Attention: Darren Williams

Email: darren@arbus.com.au

Subject: Water sampling for Per- and poly-fluorinated alkyl substances
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 groundwater and surface sampling 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

The site is located within the New South Wales Environment Protection Authority (EPA) Williamtown 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).

RCA Australia (RCA) undertook a groundwater assessment at the site in June 2016, and reported that PFAS was not detected in the three groundwater monitoring wells sampled at the site. In February 2017 Kleinfelder completed a soil assessment of the proposed WSS sand quarry to determine if PFAS was present within the shallow soil of the proposed quarry footprint. Sixteen soil samples were collected using hand tools and submitted to the laboratory for analysis. The results of the assessment showed that PFAS was not detected in any of the soil samples. Based on the results, the distance from the quarrying area, it was considered unlikely that future site users or surrounding residents would be exposed to PFAS in dust generated by the proposed quarrying works and that further monitoring is not necessary.

Stage 2 and 2B investigations targeting the Williamtown PFAS Investigation Area (URS, 2014 and AECOM, 2016) reported inferred regional groundwater flow direction to be to the south south-east, from the Williamtown RAAF base towards Tilligerry Creek. Figures from AECOM's investigations presenting groundwater elevation data and inferred groundwater flow and surface water drainage and flow direction are presented in **Appendix A**.

2. OBJECTIVES

The objective of the groundwater and surface water sampling was to determine if PFAS present in the groundwater and surface water in the southern portion of the site.

3. SCOPE OF WORK

In order to achieve the stated objectives, Kleinfelder completed the following scope of works on 29 May 2017:

- Collected four groundwater samples from four groundwater monitoring wells (BH2, BH3, BH4 and BH9) using a dedicated disposable bailer for each well.
- Collected one surface water sample (SW1) from ponded water observed in the south-eastern portion of the site using a disposable bailer.
- The groundwater and surface water samples were submitted to National Association of Testing Authorities (NATA)-accredited laboratories ALS Environmental (ALS) and Eurofins | mgt for analysis for a suite of 28 PFAS, including Perfluorooctane sulfonate (PFOS) and Perfluorooctanoic acid (PFOA).
- Undertook quality assurance/quality control (QA/QC) procedures collection of inter- and intra- laboratory duplicate samples.

Groundwater monitoring well locations and the surface water sample location are presented in **Figure 2**.

4. ADOPTED SITE CRITERIA

4.1 HEALTH BASED GUIDANCE VALUES

The Food Standards Australia New Zealand (FSANZ) was tasked by the Australian Department of Health to develop health based guidance values for PFOS, PFOA and perfluorohexane sulfonate (PFHxS). These guidance values are protective of human health and are to be used as a precautionary measure for use when conducting site investigations. The FSANZ recommended the health values for PFOS and PFOA in the form of daily tolerable intake (TDI). A TDI refers to the daily amount of a chemical that has been assessed as safe for one person over a lifetime. The health based guidance values are presented in **Table 4.1**.

Table 4.1: Health Based Guidance Values for Site Investigations

Toxicity Reference Value	PFOS/PFHxS		PFOA	
	ng	µg	ng	µg
Tolerable daily intake (ng or µg /kg bw/day)	20	0.02	160	0.16
Drinking water quality value (ng or µg /L)	70	0.07	560	0.56
Recreational water quality value (ng or µg /L)	700	0.7	5,600	5.6

Note: bw = body weight, ng = nanograms, µg = micrograms

4.2 ECOLOGICAL SCREEN LEVELS

The Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) has released Technical Report no. 38: *Assessment, management and remediation guidance for perfluorooctanesulfonate (PFOS) and perfluorooctanoic acid (PFOA) – Part 3: ecological screening levels* (March 2017). This guidance is to be considered as both draft and interim. Ecological screening levels (ESLs), presented in **Table 4.2**, are not compliance values, and should these levels be exceeded further investigation is required as there are potential adverse environmental impacts.

Table 4.2: Ecological Screening Levels in Marine Aquatic Ecosystems

Species Protection	PFOS	PFOA
99% species protection – high conservation	0.29	3,000
95% species protection – slightly to moderately disturbed systems	7.8	8,500
90% species protection – highly disturbed	32	14,000
80% species protection – highly disturbed	130	22,000

Note: values are in µg/L

5. ANALYTICAL RESULTS

Complete copies of the NATA endorsed analytical reports, with analytical methods and analytical results, and accompanying chain-of-custody documentation for groundwater samples are provided in **Appendix B**. Groundwater and surface water analytical results are summarised in **Table 5.1**.

Table 5.1: Groundwater and Surface Water Analytical Summary

Sample ID	PFHxS	PFOS	PFOA	Sum of PFHxS and PFOS	Samples Exceeding Adopted Criteria
BH2	<0.02	<0.01	<0.01	<0.01	None
BH3	<0.02	<0.01	<0.01	<0.01	None
BH4	<0.02	<0.01	<0.01	<0.01	None
BH9	<0.02	<0.01	<0.01	<0.01	None
QC01	<0.02	<0.01	<0.01	<0.01	None
Eurofins dup	<0.01	<0.01	<0.01	<0.01	None
SW1	<0.02	<0.01	<0.01	<0.01	None

Note: values are in µg/L

All results were below the laboratory limit of reporting (LOR). Furthermore, the laboratory LOR was less than the adopted screening values.

5.1 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.
- Laboratory duplicates, method blanks, matrix spikes, laboratory control samples.

- A rinsate blank sample was not collected, as samples were collected using a dedicated disposable bailer for each groundwater monitoring well and surface water location. A trip blank sample was not collected due to the low volatility of the potential contaminant of concern.

All groundwater duplicate samples reported relative percent differences (RPDs) less than the 50% acceptance criterion. Review of the internal laboratory QA/QC program presented as part of their final NATA reports indicates that no QA/QC recovery outliers or breaches exist. Based on a review of the results for the Kleinfelder and laboratory QA/QC program adopted, the overall data quality is acceptable for interpretive use.

6. CONCLUSIONS

The results of the groundwater and surface water sampling show that PFAS is not present in the groundwater at the site. Based on the south south-easterly regional inferred groundwater and surface water flow directions presented in the Williamtown PFAS Investigation Area Stage 2 and 2B investigations (URS, 2014 and AECOM, 2016), it is unlikely that PFAS-impacted groundwater and surface water would migrate on to the site.

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

Sincerely,

Kleinfelder Australia Pty Ltd

Rachel Condon

Senior Environmental Scientist

ATTACHMENTS

Figures

Figure 1: Williamtown Investigation Area

Figure 2: Soil and Water PFAS Sampling Locations

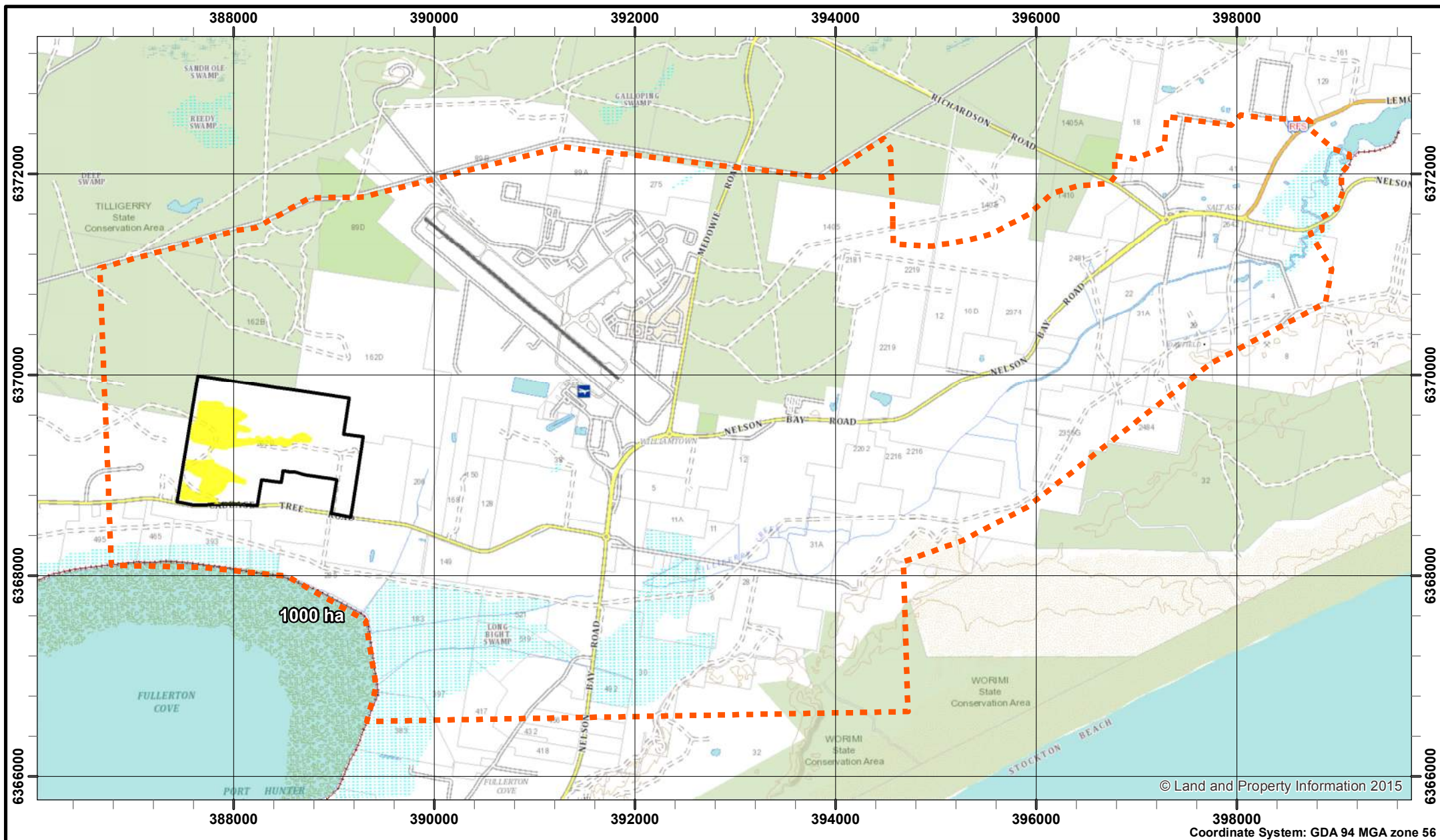
Appendices

Appendix A: Inferred Regional Water Flow Direction

Appendix B: Laboratory Analytical Results

Appendix C: Limitations

FIGURES



© Land and Property Information 2015

Coordinate System: GDA 94 MGA zone 56

Legend

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



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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

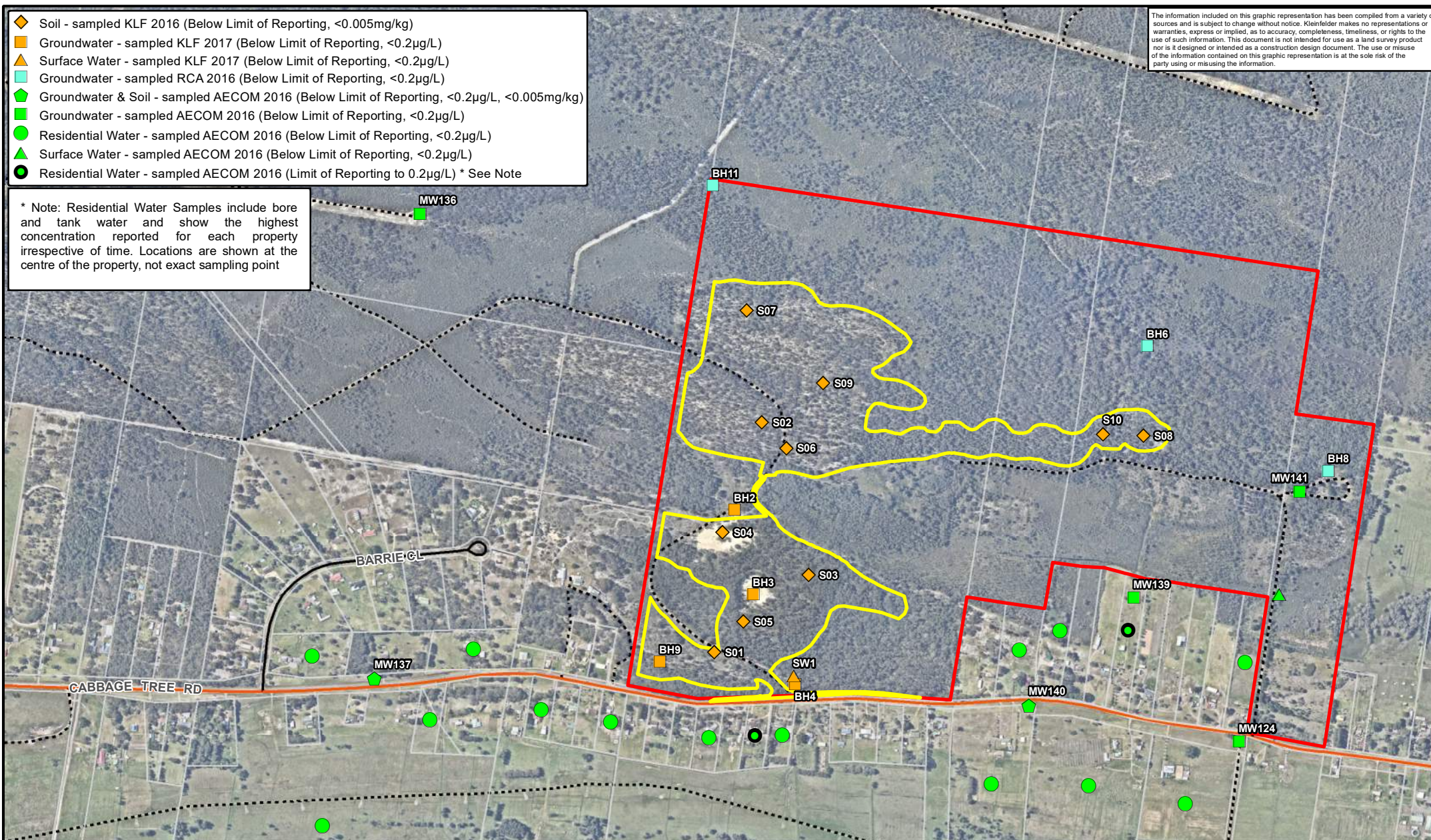
FIGURE:

1

- ◆ Soil - sampled KLF 2016 (Below Limit of Reporting, <0.005mg/kg)
- Groundwater - sampled KLF 2017 (Below Limit of Reporting, <0.2µg/L)
- ▲ Surface Water - sampled KLF 2017 (Below Limit of Reporting, <0.2µg/L)
- Groundwater - sampled RCA 2016 (Below Limit of Reporting, <0.2µg/L)
- ◆ Groundwater & Soil - sampled AECOM 2016 (Below Limit of Reporting, <0.2µg/L, <0.005mg/kg)
- Groundwater - sampled AECOM 2016 (Below Limit of Reporting, <0.2µg/L)
- Residential Water - sampled AECOM 2016 (Below Limit of Reporting, <0.2µg/L)
- ▲ Surface Water - sampled AECOM 2016 (Below Limit of Reporting, <0.2µg/L)
- Residential Water - sampled AECOM 2016 (Limit of Reporting to 0.2µg/L) * See Note

* Note: Residential Water Samples include bore and tank water and show the highest concentration reported for each property irrespective of time. Locations are shown at the centre of the property, not exact sampling point

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- Subject Land Boundary
- Quarry Project Area
- Arterial Road
- Local Road
- .. Track

Metres
0 50 100 200 300 400 500



PROJECT REFERENCE: 20170448

DATE DRAWN: 20/06/2017 19:08 Version 1

DRAWN BY: BDeane

DATA SOURCE: LPI - 2017
Nearmap - 2017
AECOM - 2016
RCA - 2016
KLF - 2017

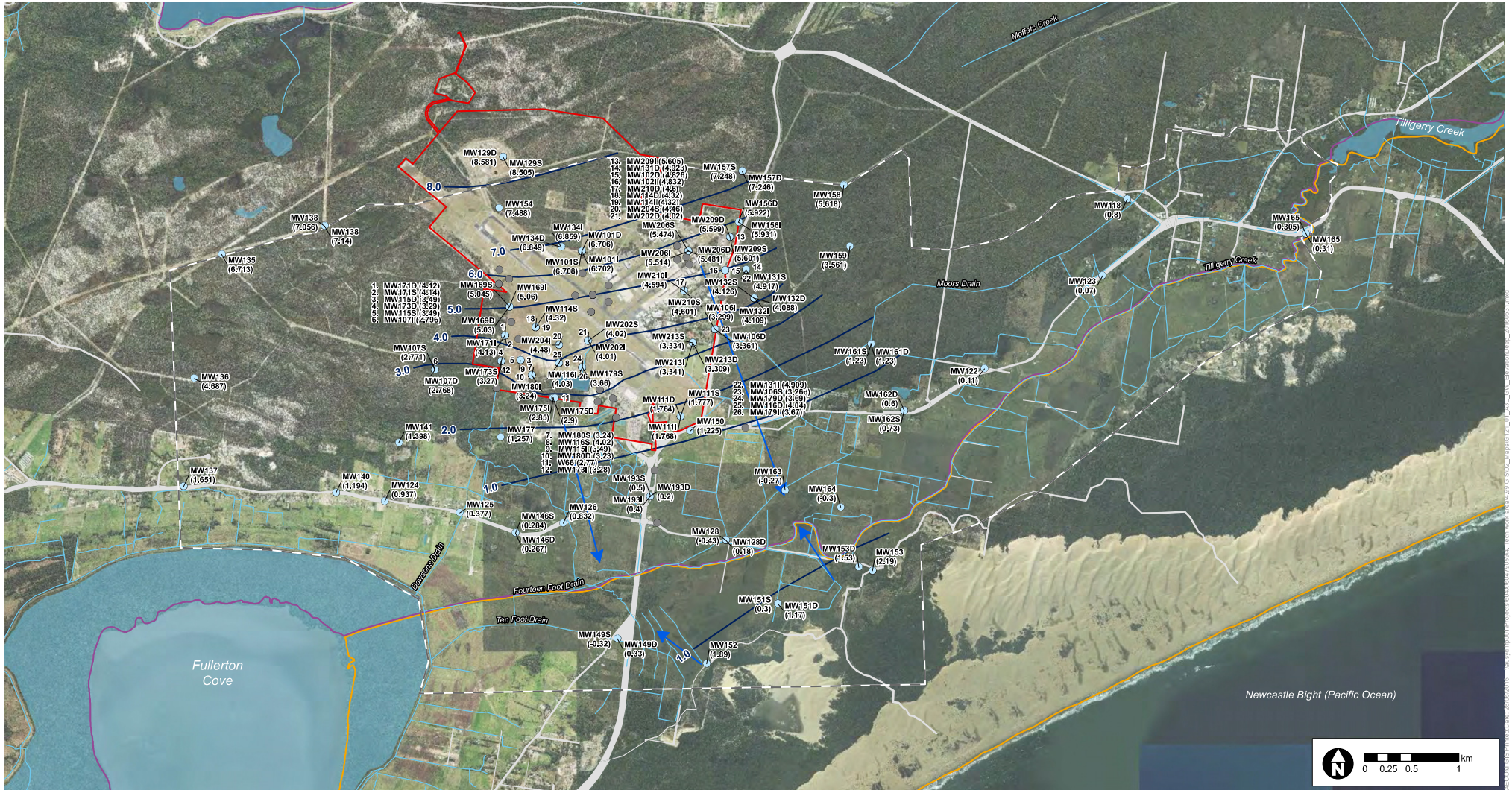
Soil and Water PFAS sampling locations

Williamtown Sand Syndicate
Proposed Sand Quarry
Cabbage Tree Road, Williamtown

FIGURE:

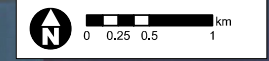
2

APPENDIX A: INFERRED REGIONAL WATER FLOW DIRECTION



- KEY**
- RAAF Base Williamtown
 - NSW EPA Investigation Area
 - Water elevations (mAHd) measured January 2016
 - Water elevations (mAHd) measured 15 March 2016
 - Surface Water and Drainage Channels
 - ➔ Inferred Groundwater flow direction
 - Groundwater Elevation Contour (mAHd, shallow aquifer)
 - Tomago aquifer
 - Stockton aquifer

Not all available data is presented herein, For privacy reasons, selected Stage 2B sample points have been removed under advice from private property owners.



AECOM

SCALE
1:40,000

SHEET
1 of 1

COORDINATE SYSTEM
GDA 1994 MGA Zone 56

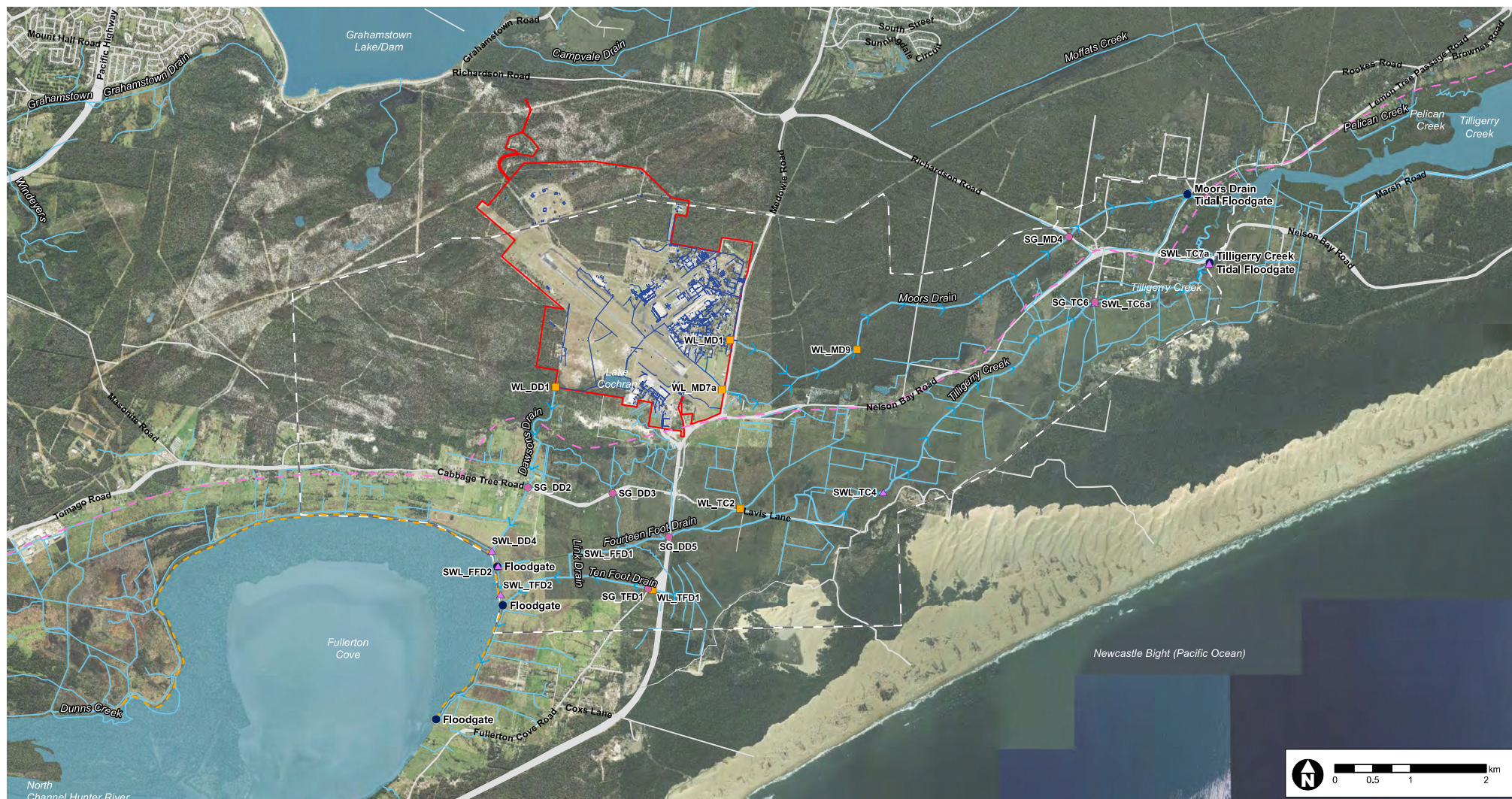
TITLE
Figure F12: Groundwater Elevations and Potentiometric Contours - Deep Wells

PROJECT
RAAF BASE WILLIAMTOWN STAGE 2B ENVIRONMENTAL INVESTIGATION

CLIENT
DEPARTMENT OF DEFENCE

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KEY

- RAAF Base Williamtown
- EPA Investigation Area
- Fullerton Cove ring drain
- Onsite pipe and open channel network
- Offsite open channel and flow paths
- Interpreted surface water flow direction
- Floodgate
- Staff Gauge (SG)
- Water Level logger (WL)
- ▲ Surveyed Water Levels (SWL)
- Boundary between Tilligerry Mud and Tomago Sand Beds

AECOM

SCALE
1:50,000

SHEET
1 of 1

COORDINATE SYSTEM
GDA 1994 MGA Zone 56

TITLE
Figure F13: Surface Water Drainage

PROJECT
RAAF BASE WILLIAMTOWN STAGE 2B
ENVIRONMENTAL INVESTIGATION

CLIENT
DEPARTMENT OF DEFENCE

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APPENDIX B: LABORATORY ANALYTICAL RESULTS

CERTIFICATE OF ANALYSIS

Work Order : **ES1712999**
Client : **KLEINFELDER AUSTRALIA PTY LTD**
Contact : **RICHARD LAMONT**
Address :
 Newcastle, NSW
Telephone : ----
Project : 127439 WILLIAMTOWN
Order number : ----
C-O-C number : ----
Sampler : RICHARD LAMONT
Site : ----
Quote number : EN/075/16
No. of samples received : 6
No. of samples analysed : 6

Page : 1 of 5
Laboratory : Environmental Division Sydney
Contact : Shirley LeCornu
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : +61-3-8549 9630
Date Samples Received : 29-May-2017 13:47
Date Analysis Commenced : 30-May-2017
Issue Date : 01-Jun-2017 12:54



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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
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.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID				
Client sampling date / time				BH2	BH3	BH4	BH9	SW1
				29-May-2017 00:00	29-May-2017 00:00	29-May-2017 00:00	29-May-2017 00:00	29-May-2017 00:00
Compound	CAS Number	LOR	Unit	ES1712999-001	ES1712999-002	ES1712999-003	ES1712999-004	ES1712999-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
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	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	86.9	84.2	81.8	84.2	83.4



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	QC01	----	----	----	----
Client sampling date / time					29-May-2017 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1712999-006	-----	-----	-----	-----
				Result	----	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	----	----	----	----
EP231P: PFAS Sums									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		78.2	----	----	----	----

Page : 5 of 5
Work Order : ES1712999
Client : KLEINFELDER AUSTRALIA PTY LTD
Project : 127439 WILLIAMTOWN



Surrogate Control Limits

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

QUALITY CONTROL REPORT

Work Order	: ES1712999	Page	: 1 of 4
Client	: KLEINFELDER AUSTRALIA PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: RICHARD LAMONT	Contact	: Shirley LeCornu
Address	: Newcastle, NSW	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-3-8549 9630
Project	: 127439 WILLIAMTOWN	Date Samples Received	: 29-May-2017
Order number	: ----	Date Analysis Commenced	: 30-May-2017
C-O-C number	: ----	Issue Date	: 01-Jun-2017
Sampler	: RICHARD LAMONT		
Site	: ----		
Quote number	: EN/075/16		
No. of samples received	: 6		
No. of samples analysed	: 6		



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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

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 (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 915139)									
ES1712977-001	Anonymous	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: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 915139)									
ES1712977-001	Anonymous	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: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 915139)									
ES1712977-001	Anonymous	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

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 915139)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	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	102	70	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.5 µg/L	94.0	70	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 915139)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	2.5 µg/L	104	70	130
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.5 µg/L	118	70	130
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.5 µg/L	97.8	70	130
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.5 µg/L	95.0	70	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.5 µg/L	119	70	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 915139)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.5 µg/L	98.8	70	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.5 µg/L	104	70	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.5 µg/L	87.6	70	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.5 µg/L	87.2	70	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: 915139)							
ES1712977-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.5 µg/L	87.4	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.5 µg/L	97.8	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.5 µg/L	124	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 915139)							
ES1712977-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	2.5 µg/L	98.7	50	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.5 µg/L	107	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.5 µg/L	71.6	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.5 µg/L	78.4	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.5 µg/L	91.0	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 915139)							



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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 915139) - continued							
ES1712977-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.5 µg/L	111	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.5 µg/L	128	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.5 µg/L	97.8	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.5 µg/L	108	50	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES1712999	Page	: 1 of 4
Client	: KLEINFELDER AUSTRALIA PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: RICHARD LAMONT	Telephone	: +61-3-8549 9630
Project	: 127439 WILLIAMTOWN	Date Samples Received	: 29-May-2017
Site	: ----	Issue Date	: 01-Jun-2017
Sampler	: RICHARD LAMONT	No. of samples received	: 6
Order number	: ----	No. of samples analysed	: 6

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

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.

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

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

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

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X) BH2, BH3, BH4, BH9, SW1, QC01	29-May-2017	----	----	----	30-May-2017	25-Nov-2017	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X) BH2, BH3, BH4, BH9, SW1, QC01	29-May-2017	----	----	----	30-May-2017	25-Nov-2017	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X) BH2, BH3, BH4, BH9, SW1, QC01	29-May-2017	----	----	----	30-May-2017	25-Nov-2017	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X) BH2, BH3, BH4, BH9, SW1, QC01	29-May-2017	----	----	----	30-May-2017	25-Nov-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: **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	10	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	10	10.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	10	10.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	10	10.00	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
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.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : ES1712999

<p>Client : KLEINFELDER AUSTRALIA PTY LTD</p> <p>Contact : RICHARD LAMONT</p> <p>Address : Newcastle, NSW</p> <p>E-mail : rlamont@kleinfelder.com</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : 127439 WILLIAMTOWN</p> <p>Order number : ----</p> <p>C-O-C number : ----</p> <p>Site : ----</p> <p>Sampler : RICHARD LAMONT</p>	<p>Laboratory : Environmental Division Sydney</p> <p>Contact : Shirley LeCornu</p> <p>Address : 277-289 Woodpark Road Smithfield NSW Australia 2164</p> <p>E-mail : shirley.lecornu@Alsglobal.com</p> <p>Telephone : +61-3-8549 9630</p> <p>Facsimile : +61-2-8784 8500</p> <p>Page : 1 of 3</p> <p>Quote number : ES2015ALLENVENG0001 (EN/075/16)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 29-May-2017 13:47	Issue Date : 29-May-2017
Client Requested Due : 01-Jun-2017	Scheduled Reporting Date : 01-Jun-2017
Date	

Delivery Details

Mode of Delivery : Undefined	Security Seal : Intact.
No. of coolers/boxes : 1	Temperature : 11 - Ice present
Receipt Detail :	No. of samples received / analysed : 6 / 6

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **Sample QC01A to be forwarded to Eurofins as per COC's.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of work order.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If 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

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP231 PFAS - Short Suite (12 analytes)
ES1712999-001	29-May-2017 00:00	BH2	✓
ES1712999-002	29-May-2017 00:00	BH3	✓
ES1712999-003	29-May-2017 00:00	BH4	✓
ES1712999-004	29-May-2017 00:00	BH9	✓
ES1712999-005	29-May-2017 00:00	SW1	✓
ES1712999-006	29-May-2017 00:00	QC01	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

[illegible]

[illegible]

Certificate of Analysis

Kleinfelder Australia Pty Ltd
Level 1, 95 Coventry St
South Melbourne
VIC 3205



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or
measurements included in this document are traceable
to Australian/national standards.

Attention: Richard Lamont

Report 548190-W
Project name WILLIAMTOWN
Project ID 127439
Received Date May 30, 2017

Client Sample ID			QC01A
Sample Matrix			Water
Eurofins mgt Sample No.			S17-My29962
Date Sampled			May 29, 2017
Test/Reference	LOR	Unit	
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA)	0.05	ug/L	< 0.05
Perfluoropentanoic acid (PFPeA)	0.01	ug/L	< 0.01
Perfluorohexanoic acid (PFHxA)	0.01	ug/L	< 0.01
Perfluoroheptanoic acid (PFHpA)	0.01	ug/L	< 0.01
Perfluorooctanoic acid (PFOA)	0.01	ug/L	< 0.01
Perfluorononanoic acid (PFNA)	0.01	ug/L	< 0.01
Perfluorodecanoic acid (PFDA)	0.01	ug/L	< 0.01
Perfluoroundecanoic acid (PFUnA)	0.01	ug/L	< 0.01
Perfluorododecanoic acid (PFDoA)	0.01	ug/L	< 0.01
Perfluorotridecanoic acid (PFTeDA)	0.01	ug/L	< 0.01
Perfluorotetradecanoic acid (PFTeDA)	0.01	ug/L	< 0.01
13C4-PFBA (surr.)	1	%	88
13C5-PFPeA (surr.)	1	%	110
13C5-PFHxA (surr.)	1	%	137
13C4-PFHpA (surr.)	1	%	133
13C8-PFOA (surr.)	1	%	124
13C5-PFNA (surr.)	1	%	148
13C6-PFDA (surr.)	1	%	103
13C2-PFUnDA (surr.)	1	%	82
13C2-PFDoDA (surr.)	1	%	83
13C2-PFTeDA (surr.)	1	%	Q09 41
Perfluoroalkane sulfonamides (PFASAs)			
Perfluorooctane sulfonamide (FOSA)	0.05	ug/L	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	0.05	ug/L	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	0.05	ug/L	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	0.05	ug/L	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	0.05	ug/L	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	0.05	ug/L	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	0.05	ug/L	< 0.05
13C8-FOSA (surr.)	1	%	84
D3-N-MeFOSA (surr.)	1	%	55
D5-N-EtFOSA (surr.)	1	%	51
D7-N-MeFOSE (surr.)	1	%	Q09 49



Client Sample ID			QC01A
Sample Matrix			Water
Eurofins mgt Sample No.			S17-My29962
Date Sampled			May 29, 2017
Test/Reference	LOR	Unit	
Perfluoroalkane sulfonamides (PFASAs)			
D9-N-EtFOSE (surr.)	1	%	65
D5-N-EtFOSAA (surr.)	1	%	86
D3-N-MeFOSAA (surr.)	1	%	90
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAAs)			
Perfluorobutanesulfonic acid (PFBS)	0.01	ug/L	< 0.01
Perfluoropentanesulfonic acid (PFPeS)	0.01	ug/L	< 0.01
Perfluorohexanesulfonic acid (PFHxS)	0.01	ug/L	< 0.01
Perfluoroheptanesulfonic acid (PFHpS)	0.01	ug/L	< 0.01
Perfluorooctanesulfonic acid (PFOS) ^{N11}	0.01	ug/L	< 0.01
Perfluorodecanesulfonic acid (PFDS)	0.01	ug/L	< 0.01
13C3-PFBS (surr.)	1	%	118
18O2-PFHxS (surr.)	1	%	121
13C8-PFOS (surr.)	1	%	130
n:2 Fluorotelomer sulfonic acids			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	0.05	ug/L	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	0.01	ug/L	< 0.01
13C2-4:2 FTS (surr.)	1	%	^{Q09} 203
13C2-6:2 FTS (surr.)	1	%	143
13C2-8:2 FTS (surr.)	1	%	111

Sample History

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

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

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

Description	Testing Site	Extracted	Holding Time
Per- and Polyfluorinated Alkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	May 31, 2017	14 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
Perfluoroalkane sulfonamides (PFASAs)	Brisbane	May 31, 2017	14 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)	Brisbane	May 31, 2017	14 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
n:2 Fluorotelomer sulfonic acids	Brisbane	May 31, 2017	14 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			

Company Name: Kleinfelder Australia Pty Ltd
Address: Level 1, 95 Coventry St
South Melbourne
VIC 3205
Project Name: WILLIAMTOWN
Project ID: 127439

Order No.:
Report #: 548190
Phone: 03 9907 6000
Fax: 03 9907 6001

Received: May 30, 2017 12:17 PM
Due: Jun 1, 2017
Priority: 2 Day
Contact Name: Richard Lamont

Eurofins | mgt Analytical Services Manager : Onur Mehmet

Sample Detail						Per- and Polyfluorinated Alkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						
Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						X
Perth Laboratory - NATA Site # 18217						
External Laboratory						
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID	
1	QC01A	May 29, 2017		Water	S17-My29962	X
Test Counts						1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. All biota results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkane sulfonamides (PFASAs)							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFASs)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	98			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	107			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	91			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	101			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	111			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	103			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	95			50-150	Pass	
Perfluoroundecanoic acid (PFUnA)	%	97			50-150	Pass	
Perfluorododecanoic acid (PFDoA)	%	100			50-150	Pass	
Perfluorotridecanoic acid (PFTTrDA)	%	72			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	104			50-150	Pass	
LCS - % Recovery							
Perfluoroalkane sulfonamides (PFASAs)							

Test				Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorooctane sulfonamide (FOSA)				%	96			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)				%	101			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)				%	132			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)				%	109			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)				%	110			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)				%	98			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)				%	92			50-150	Pass	
LCS - % Recovery										
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)										
Perfluorobutanesulfonic acid (PFBS)				%	84			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)				%	87			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)				%	92			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)				%	77			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)				%	92			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)				%	96			50-150	Pass	
LCS - % Recovery										
n:2 Fluorotelomer sulfonic acids										
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)				%	113			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)				%	89			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)				%	107			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)				%	101			50-150	Pass	
Test		Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate										
Perfluoroalkyl carboxylic acids (PFCAs)					Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	B17-My23982	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass		
Perfluoropentanoic acid (PFPeA)	B17-My23982	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass		
Perfluorohexanoic acid (PFHxA)	B17-My23982	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass		
Perfluoroheptanoic acid (PFHpA)	B17-My23982	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass		
Perfluorooctanoic acid (PFOA)	B17-My23982	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass		
Perfluorononanoic acid (PFNA)	B17-My23982	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass		
Perfluorodecanoic acid (PFDA)	B17-My23982	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass		
Perfluoroundecanoic acid (PFUnA)	B17-My23982	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass		
Perfluorododecanoic acid (PFDoA)	B17-My23982	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass		
Perfluorotridecanoic acid (PFTTrDA)	B17-My23982	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass		
Perfluorotetradecanoic acid (PFTeDA)	B17-My23982	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass		
Duplicate										
Perfluoroalkane sulfonamides (PFASAs)					Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	B17-My23982	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass		
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	B17-My23982	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass		
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B17-My23982	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass		
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	B17-My23982	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass		
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	B17-My23982	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass		
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B17-My23982	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass		
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	B17-My23982	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass		

Duplicate								
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSA's)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	B17-My23982	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	B17-My23982	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	B17-My23982	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	B17-My23982	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	B17-My23982	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	B17-My23982	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
n:2 Fluorotelomer sulfonic acids				Result 1	Result 2	RPD		
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	B17-My23982	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	B17-My23982	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	B17-My23982	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	B17-My23982	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds. Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).
Q09	The Surrogate recovery is outside of the recommended acceptance criteria due to matrix interference. Acceptance criteria were met for all other QC

Authorised By

Onur Mehmet	Analytical Services Manager
Jonathon Angell	Senior Analyst-Organic (QLD)



Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

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

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Company Name: Kleinfelder Australia Pty Ltd
Address: Level 1, 95 Coventry St
South Melbourne
VIC 3205

Project Name: WILLIAMTOWN
Project ID: 127439

Order No.:
Report #: 548190
Phone: 03 9907 6000
Fax: 03 9907 6001

Received: May 30, 2017 12:17 PM
Due: Jun 1, 2017
Priority: 2 Day
Contact Name: Richard Lamont

Eurofins | mgt Analytical Services Manager : Onur Mehmet

Sample Detail						Per- and Polyfluorinated Alkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						
Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						X
Perth Laboratory - NATA Site # 18217						
External Laboratory						
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID	
1	QC01A	May 29, 2017		Water	S17-My29962	X
Test Counts						1

Sample Receipt Advice

Company name: **Kleinfelder Australia Pty Ltd**

Contact name: **Richard Lamont**

Project name: **WILLIAMTOWN**

Project ID: **127439**

COC number: **Not provided**

Turn around time: **2 Day**

Date/Time received: **May 30, 2017 12:17 PM**

Eurofins | mgt reference: **548190**

Sample information

- ☒ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ☒ Sample Temperature of a random sample selected from the batch as recorded by Eurofins | mgt
Sample Receipt : 14 degrees Celsius.
- ☒ All samples have been received as described on the above COC.
- ☒ COC has been completed correctly.
- ☒ Attempt to chill was evident.
- ☒ Appropriately preserved sample containers have been used.
- ☒ All samples were received in good condition.
- ☒ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ☒ Appropriate sample containers have been used.
- ☒ Sample containers for volatile analysis received with zero headspace.
- ☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Onur Mehmet on Phone : (+61) (3) 8564 5026 or by e.mail: OnurMehmet@eurofins.com

Results will be delivered electronically via e.mail to Richard Lamont - rlamont@kleinfelder.com.



2/6

548190

Client: Kleinfelder Australia Pty Ltd 95 Mitchell Road Cardiff NSW 2285 Phone: 02 4949 5200		SITE, COC AND CONTACT DATA				Laboratory: ALS 277-289 Woodpark Road Smithfield NSW 2164 Phone: (02) 8784 6555	
Site Name: Williamtown QUOTE NUMBER: Job No.: 127438 Required TAT: 2 day By the 1st June X Date QA level: LAB minimum unless specified:		Sample Name: Richard Lamont Contact Number: 0401 002912 Contact e-mail: rlamont@kleinfelder.com.au PM name (if not sampled): Rachel Condon/Jonathan Berry PM e-mail: rcondon@kleinfelder.com.au / jberry@kleinfelder.com.au					
CHAIN OF CUSTODY Relinquished by (print): R. Lamont (sign): [Signature]		Received by (print): Mark S (sign): [Signature]		Relinquished: (sign): [Signature]		Received by: [Signature] (sign): [Signature]	
Date / Time: 29/05/2017 Temp. (°C): 11 Notes:		Date / Time: 29/05/17 1:47 Temp. (°C): 11 Notes: ice present / no ice seals intact / no seal		Date / Time: 30/5 12:17pm Temp. (°C): 14 Notes: ice present / no ice seals intact / no seal			
				Organic Analytes		Metals	
				Other Analytes			
Sample ID	Lab ID	Sample Point	Sample Type	Date	Start Depth	End Depth	Units
BH2	1		W	29/05/2017			
BH3	2		W	29/05/2017			
BH4	3		W	29/05/2017			
BH4-BH9	4		W	29/05/2017			
SW1	5		W	29/05/2017			
SW2			W	29/05/2017			
SW3			W	29/05/2017			
SW4			W	29/05/2017			
QC01	6		W	29/05/2017			
QC01A	10		W	29/05/2017			
Comments							
Environmental Division Sydney Work Order Reference ES1712999							
please send to Eurofins							
Substrate: [Signature] / Soil WO							
Lab: [Signature] / QC01A / Eurofins							
Organized by / Date:							
Relinquished By / Date:							
Contact / Courier:							
WO 10							

Attach to Internal Sheet: _____

APPENDIX C: LIMITATIONS

The findings and conclusions contained within this report are made following a review of information, reports, correspondence and data previously reported by third parties. Kleinfelder does not provide guarantees or assurances regarding the accuracy and validity of information and data obtained by third parties in previously commissioned investigations. 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.

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.

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