APPLICATIONS TO THE ACAT

To apply for a review, obtain an application form from the ACAT. You can also download the form from the ACT Legislation Register http://www.legislation.act.gov.au/af/2009-278/current/pdf/2009-278.pdf.

If you are applying on behalf of an organisation or association of persons, whether incorporated or not, the Tribunal in deciding whether to support this application will consider the effect of the decision being reviewed on the interests of the organisation or association in terms of its objects or purposes. A copy of the relevant documents will be required to be lodged with the Tribunal.

TIME LIMITS FOR APPLICATIONS

The time limit to make a request for a review is 28 days from the date of this Notice of decision. The time limit can be extended in some circumstances (refer to sections 10 (2), 10(3), 25(1)(e) and 25(2) of the *ACT Civil & Administrative Tribunal Act 2008;* section 7 of the *ACT Civil and Administrative Tribunal Procedure Rules 2009 (No 2);* and section 409 of the *Planning and Development Act 2007*).

FEES

Applications to the ACAT, including an application to be joined as a party to a proceeding, require payment of a fee (the Tribunal Registry will advise of the current fee), unless you are receiving legal or financial assistance from the ACT Attorney-General. You can apply to have the fee waived on the grounds of hardship, subject to approval (refer to section 22T of the *ACT Civil and Administrative Tribunal Act 2008*). Decisions to grant assistance are made on the grounds of hardship and that it is reasonable, in all the circumstances, for the assistance to be granted. Write to: The Chief Executive, Justice and Community Safety Directorate, GPO Box 158, CANBERRA ACT 2601. Ask the ACAT for more details.

TIME LIMITS FOR REVIEWS OF DECISIONS

The ACAT is required to decide appeals in land and planning and tree protection cases within 120 days after the lodging of the appeal, unless that period is extended by the ACAT upon it being satisfied that it is in the interests of justice to do so.

FORMS OF LEGAL, FINANCIAL AND OTHER ADVICE AND ASSISTANCE

The following organisations can provide advice and assistance if you are eligible:

- ACT Attorney-General, write to The Chief Executive, Justice and Community Safety Directorate, GPO Box 158, CANBERRA, ACT, 2601;
- the ACT Legal Aid Office, telephone 1300 654314;
- Legal Advice Bureau, telephone (02) 6247 5700;
- ACT Council of the Ageing, telephone (02) 6282 3777;
- Welfare Rights and Legal Centre, telephone (02) 6247 2177; and
- Environmental Defender's Office (ACT), telephone (02) 6247 9420.

AWARDING OF COSTS

You will have to pay any costs involved in preparing or presenting your case. The ACAT also has the power to award costs against a party if the party contravenes a direction of the ACAT and the ACAT considers it in the interests of justice to make such an order. This power is in addition to the power of the ACAT to strike out a party and to dismiss an application for failure to comply with the ACAT's directions.

ACCESS TO DOCUMENTS ABOUT THE DECISION

You may apply for access to any documents you consider relevant to this decision under the ACT Freedom of Information Act 1989. Information about Freedom of information requests is available on the planning and land authority's web site or by contacting us by phone on (02) 6207 1923.

PROCEDURES OF THE ACAT

The procedures of the ACAT are outlined on the ACAT's website, including in the Guide to the Land and Planning Division and the Guide to the Hearing. Contact the ACAT for alternative ways to access information about the ACAT's procedures.

TRANSLATION AND INTERPRETER SERVICES

The ACT Government's translation and interpreter service runs 24 hours a day, every day of the week. Telephone 131 450.

ENGLISH	If you need interpreting help, telephone:
ARABIC	إذا احتجت لمساعدة في الترجمة الشفوية ، إتصل برقم الهاتف :
CHINESE	如果你需要传译员的帮助，请打电话：
CROATIAN	Ako trebate pomoć tumača telefonirajte:
GREEK	Αν χρειάζεστε διερμηνέα τηλεφωνήσετε στο
ITALIAN	Se avete bisogno di un interprete, telefonate al numero:
MALTESE	Jekk għandek bżonn l-għajnuna t'interpretu, ċempel:
PERSIAN	اگر به ترجمه شفاهی احتیاج دارید به این شماره تلفن کنید:
PORTUGUESE	Se você precisar da ajuda de um intérprete, telefone:
SERBIAN	Ако вам је потребна помоћ преводиоца телефонирајте:
SPANISH	Si necesita la asistencia de un intérprete, llame al:
TURKISH	Tercümana ihtiyacınız varsa lütfen telefon ediniz:
VIETNAMESE	Nếu bạn cần một người thông-ngôn hãy gọi điện-thoại:

TRANSLATING AND INTERPRETING SERVICE

131 450

Canberra and District - 24 hours a day, seven days a week

Stedman, Andrew (Health)

From: Bvirakare, Faith (Health)
Sent: Wednesday, 16 August 2017 10:10 AM
To: Rogers, Keith (Health)
Cc: Stedman, Andrew (Health)
Subject: FW: PFOS & PFOA - AECOM Summary report [SEC=UNCLASSIFIED]
Attachments: ATT00001.htm; ATT00002.htm; ATT00003.htm

Hi Keith,

Had a call from [redacted] (from Charnwood childcare centre) and he was saying that the reports we requested were already included in the site investigation report that was part of the documents provided at the initial lodging of the DA application (from page 595 with PFOS reported on page 600). The report is attached in his email below.

Could you please call him back as he would like an update on whether they can move on as this is the only issue holding them down.

Thanks

ACT Government Health

Faith Bvirakare | Public Health Officer / Environmental Health
Health Protection Service | health.act.gov.au
Phone (02) 6205 9616 | Mobile [redacted]

From: Rob Klacek [mailto:[redacted]@peachandco.com.au]
Sent: Wednesday, 16 August 2017 9:50 AM
To: Bvirakare, Faith (Health) <Faith.Bvirakare@act.gov.au>
Cc: [redacted]@kasparek.com.au>
Subject: Re: PFOS & PFOA - AECOM Summary report [SEC=UNCLASSIFIED]

Download Attachment
Available until 15 Sep 2017

Rogers, Keith (Health)

From: Pradhan, Jyoti
Sent: Monday, 21 August 2017 8:47 AM
To: Rogers, Keith (Health)
Subject: RE: DA231430-S141A & B-22/97 CHARNWOOD - ACT HEALTH Comments - release of Demo Plan [SEC=UNCLASSIFIED]

Hi Keith,

Thanks for keeping me informed. I'll release the plan soon.

Hope you too have a fantastic week.

Regards,
Jyoti

Jyoti Pradhan

Assessment Officer | DA Merit Assessment - Commercial
(Working hours - Monday to Friday 8.00am - 2.30pm)
Phone 02 6207 1649 | Fax 02 6207 1856 |
Planning Delivery Division | Environment, Planning and Sustainable Development Directorate | **ACT Government**
Dame Pattie Menzies House, Challis Street, Dickson | GPO Box 1908 Canberra ACT 2601 | www.actpla.act.gov.au

---

From: Rogers, Keith (Health)
Sent: Monday, 21 August 2017 8:44 AM
To: Pradhan, Jyoti <Jyoti.Pradhan@act.gov.au>
Subject: RE: DA231430-S141A & B-22/97 CHARNWOOD - ACT HEALTH Comments - release of Demo Plan [SEC=UNCLASSIFIED]

Hi Jyoti,

I spoke with the applicant last week about the requirements of our condition within the NOD. They believed they had already complied hence they missed it completely, but after speaking with me they have been set on the right track which is confirmed by this request to release the demo plan.

Thanks for including us in the release of documents – this one is simple as no construction will result.

We will be in contact later in the process.

Have a great week.

Keith.

ACT Government Health

Keith Rogers | Senior Public Health Officer / Environmental Health
Health Protection Service | health.act.gov.au
Phone (02) 6205 1716 | Mobile [redacted]

From: Pradhan, Jyoti
Sent: Monday, 21 August 2017 8:33 AM
To: Rogers, Keith (Health) <Keith.Rogers@act.gov.au>
Subject: RE: DA231430-S141A & B-22/97 CHARNWOOD - ACT HEALTH Comments - release of Demo Plan [SEC=UNCLASSIFIED]

Hi Keith,

Thanks for confirming. Appreciate your quick response.

Regards,
Jyoti

Jyoti Pradhan

Assessment Officer | DA Merit Assessment - Commercial
(Working hours - Monday to Friday 8.00am - 2.30pm)
Phone 02 6207 1649 | Fax 02 6207 1856 |
Planning Delivery Division | Environment, Planning and Sustainable Development Directorate | **ACT Government**
Dame Pattie Menzies House, Challis Street, Dickson | GPO Box 1908 Canberra ACT 2601 | www.actpla.act.gov.au

---

From: Rogers, Keith (Health)
Sent: Monday, 21 August 2017 8:32 AM
To: Pradhan, Jyoti <Jyoti.Pradhan@act.gov.au>
Cc: Gell, Chris <Chris.Gell@act.gov.au>
Subject: RE: DA231430-S141A & B-22/97 CHARNWOOD - ACT HEALTH Comments - release of Demo Plan [SEC=UNCLASSIFIED]

Hi Jyoti,

Makes sense and is fine with me.

Thanks,

ACT Government Health

Keith Rogers | Senior Public Health Officer / Environmental Health
Health Protection Service | health.act.gov.au
Phone (02) 6205 1716 | Mobile [redacted]

From: Pradhan, Jyoti
Sent: Monday, 21 August 2017 8:30 AM
To: Rogers, Keith (Health) <Keith.Rogers@act.gov.au>
Cc: Gell, Chris <Chris.Gell@act.gov.au>
Subject: RE: DA231430-S141A & B-22/97 CHARNWOOD - ACT HEALTH Comments - release of Demo Plan [SEC=UNCLASSIFIED]

Good morning Keith,

The applicant has requested to release the Demolition Plan so that they can undertake demolition of the existing building. This is required so that they can get BA approval of the building in order to complete the soil testing to meet the conditions of the NOD.

In regards to the above, the authority has no objection in releasing the Demolition Plan, as construction cannot commence unless all conditions of approval are met. All other design plan will only be released once the HPS endorsement is received.

I hope this is fine by you. Please confirm.

Regards,
Jyoti

Jyoti Pradhan

Assessment Officer | DA Merit Assessment - Commercial
(Working hours - Monday to Friday 8.00am - 2.30pm)
Phone 02 6207 1649 | Fax 02 6207 1856 |
Planning Delivery Division | Environment, Planning and Sustainable Development Directorate | **ACT Government**
Dame Pattie Menzies House, Challis Street, Dickson | GPO Box 1908 Canberra ACT 2601 | www.actpla.act.gov.au

From: Rogers, Keith (Health)
Sent: Friday, 28 July 2017 10:21 AM
To: Pradhan, Jyoti <Jyoti.Pradhan@act.gov.au>
Subject: RE: DA231430-S141A & B-22/97 CHARNWOOD - ACT HEALTH Comments - condition of approval [SEC=UNCLASSIFIED]

Good morning Jyoti,

I discussed this with Conrad yesterday afternoon and we are happy to take your preferred approach and include our requirements as conditions of approval.

we have requested further soil testing across the site to quantify the extent of the site which may be affected, it may be that the proponent can design a centre using appropriate mitigation measures to eliminate the risk of soil consumption by children.

Our endorsement therefore may be of suitable mitigation measures they propose to eliminate/reduce the risk to children.

Kind regards,

ACT Government Health
Care Excellence Collaboration Integrity

Keith Rogers
Senior Public Health Officer | Environmental Health
Health Protection Service | Population Health Protection and Prevention | ACT Health
25 Mulley Street Holder ACT | Locked Bag 5005 Weston Creek ACT 2611
T 02 6205 1716 | **M** [redacted] | **E** keith.rogers@act.gov.au | www.health.act.gov.au |

ACT Government Health

Keith Rogers | Senior Public Health Officer / Environmental Health
Health Protection Service | health.act.gov.au
Phone (02) 6205 1716 | Mobile 0401 134 072

From: Pradhan, Jyoti
Sent: Thursday, 27 July 2017 11:23 AM
To: Rogers, Keith (Health)
Cc: Barr, Conrad (Health)
Subject: DA231430-S141A & B-22/97 CHARNWOOD - ACT HEALTH Comments - condition of approval [SEC=UNCLASSIFIED]
Importance: High

Good morning Keith,

Thank you for your comments in regards to the proposed child care centre at the above mentioned site in Charnwood.

I've discussed the matters raised in your letter with a senior officer. We acknowledge that the applicant must provide the requested information to HPS and all issues must be addressed prior to the construction of the proposed centre.

However, it is preferred (from the DA assessment point of view) that the HPS requested information is included as 'conditions of approval' in the Notice of Decision, which will require the applicant to provide all the information/test reports etc to HPS and seek endorsement. And unless and until the applicant provides the authority a copy of the HPS endorsement on the suitability of the site for the proposed use of a child care centre, the authority will not release approved stamped drawings to the applicant and construction cannot commence on site.

We trust the above course of action is acceptable.

Regards,
Jyoti

Jyoti Pradhan

Assessment Officer | DA Merit Assessment - Commercial
(Working hours - Monday to Friday 8.00am - 2.30pm)
Phone 02 6207 1649 | Fax 02 6207 1856 |
Planning Delivery Division | Environment, Planning and Sustainable Development Directorate | **ACT Government**
The Pattie Menzies House, Challis Street, Dickson | GPO Box 1908 Canberra ACT 2601 | www.actpla.act.gov.au

---

From: Moroney, Rebecca (Health)
Sent: Wednesday, 26 July 2017 5:02 PM
To: Pradhan, Jyoti
Cc: Barr, Conrad (Health); Krsteski, Radomir (Health); Rogers, Keith (Health); Smith, Cathie (Health)
Subject: FW: REFERRAL-ACT HEALTH-201731430-S141A & B-22/97 CHARNWOOD-comments overdue [SEC=UNCLASSIFIED]
Importance: High

Good Afternoon Jyoti

Please see attached comments from HPS for this DA.
Our comments were originally sent on the 24th July, unfortunately to the incorrect email address which is why you did not receive them.
It is very important that you receive these comments as HPS does not agree to this application.

Rebecca Moroney
PA to Conrad Barr - ED HPS
Phone : 02 6205 4402

From: Moroney, Rebecca (Health) **On Behalf Of** Barr, Conrad (Health)
Sent: Wednesday, 26 July 2017 4:55 PM
To: Moroney, Rebecca (Health)
Subject: FW: REFERRAL-ACT HEALTH-201731430-S141A & B-22/97 CHARNWOOD-comments overdue [SEC=UNCLASSIFIED]

Thank you - Bec ☺

Rebecca Moroney
PA to Conrad Barr - ED HPS
Phone : 02 6205 4402

From: Pradhan, Jyoti
Sent: Wednesday, 26 July 2017 4:12 PM

To: Barr, Conrad (Health)
Subject: FW: REFERRAL-ACT HEALTH-201731430-S141A & B-22/97 CHARNWOOD-comments overdue [SEC=UNCLASSIFIED]

Good afternoon Mr Barr,

I refer to the subject DA for proposed childcare centre in Charnwood.

The applicant has provided further information in response to the concerns raised in the HPS advice. The information was referred to HPS on 3 July 2017 for further comments.

The comments are now overdue. Could you please check the attached info and provide your comments asap, preferably by Friday please.

Please note that EPA has supported the proposed development.

Regards,
Jyoti

Jyoti Pradhan

Assessment Officer | DA Merit Assessment - Commercial
(Working hours - Monday to Friday 8.00am - 2.30pm)
Phone 02 6207 1649 | Fax 02 6207 1856 |
Planning Delivery Division | Environment, Planning and Sustainable Development Directorate | **ACT Government**
Dame Pattie Menzies House, Challis Street, Dickson | GPO Box 1908 Canberra ACT 2601 | www.actpla.act.gov.au

---

From: EPD, Customer Services
Sent: Monday, 3 July 2017 9:45 AM
To: HPS
Subject: REFERRAL-ACT HEALTH-201731430-S141A & B-22/97 CHARNWOOD-01 [SEC=UNCLASSIFIED]

PLEASE IGNORE PREVIOUS EMAIL

DEVELOPMENT APPLICATION NO: 201731430 S141A & B
BLOCK: 22 **SECTION**: 97 **DIVISION:** CHARNWOOD

S141 Further Information prior to decision – PROPOSAL FOR NEW COMMERCIAL DEVELOPMENT - demolition of the existing buildings and construction of a childcare centre and pre-school, landscaping, surface car park, services intrastructure, signage and associated site works.

Pursuant to Section 148(1) of the Planning and Development Act 2007 the ACT Planning and Land Authority requests that you consider the above mentioned development application and provide any written advice no later than 15 working days after the date of this notice **(24/07/2017).**

In accordance with Section 150 of the Planning and Development Act 2007 If advice is not received within the prescribed time it will be taken that you have supported the application.

Please forward any written advice via email to Customer Services

EPDcustomerservices@act.gov.au

Please use the following format in the subject line of the email when providing advice:

COMM-Agency Name-20080XXXX-Block XX Section XX SuburbXXXXX-01
Example: COMM-Heritage-200801234-Block 10 Section 10 Dickson-01

Kind Regards

Customer Services

Phone 02 6207 1923
Access Canberra | ACT Government
Dame Pattie Menzies House, Challis Street, Dickson | GPO Box 158 Canberra ACT 2601

Access Canberra is an ACT Government service that brings together customer and regulatory services, including the former Environment and Planning Directorates Customer Services Team. Access Canberra has been set up to make it easier for business, community organisations and individuals to work with ACT Government and deliver a more seamless experience.

www.planning.act.gov.au |EPDcustomerservices@act.gov.au

Stedman, Andrew (Health)

From: Rogers, Keith (Health)
Sent: Monday, 23 October 2017 4:12 PM
To: Stedman, Andrew (Health)
Cc: Bvirakare, Faith (Health); Durant, Sam (Health)
Subject: FW: Referral-Health-Development Application - 201731430-22-97-Charnwood-01 [SEC=UNCLASSIFIED]

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Andrew,

This email will require a response from the ED regarding the PFAS/Charnwood Child care centre DA.

The report submitted is in response to the condition placed on the NOD which means the proponent cannot move forward without our support.

Adrian Farrant was involved and verified the calculations, and I believe the response went through Rad, Vojkan, Vanessa and Brett before Conrad.

Let me know if you need any information or assistance with the response.

Regards,

Keith Rogers | Senior Public Health Officer
Phone: 02 6205 1716 | Mobile: [redacted] | Email: keith.rogers@act.gov.au
Health Protection Service | Population Health Protection and Prevention | ACT Health | ACT Government
25 Mulley Street, Holder ACT 2611 | health.act.gov.au/hps

From: [redacted] [redacted]@arcadis.com]
Sent: Monday, 23 October 2017 3:59 PM
To: Rogers, Keith (Health) <Keith.Rogers@act.gov.au>
Subject: FW: Referral-Health-Development Application - 201731430-22-97-Charnwood-01

Amended with title.

Afternoon Keith,

Arcadis is seeking endorsement of the report titled '**SOIL PFAS INVESTIGATION – 172678,** Block 22 Section 97, Charnwood ACT ' from the Health Protection Service (HPS).

This report can be downloaded from the link provided:

https://spaces.hightail.com/space/0Ec4ser0mp

This report is related to the development application 201731430.

Please contact myself if you have any questions.

Regards,

[redacted] | [redacted] | BSc Environment & Sustainability | [redacted]@arcadis.com

Arcadis | Unit 5/9 Beaconsfield Street, Fyshwick Canberra | ACT 2609 | Australia
T. + 61 [redacted] | M. + [redacted]
www.arcadis.com/au

Environmental Strategies

ARCADIS Design & Consultancy for natural and built assets

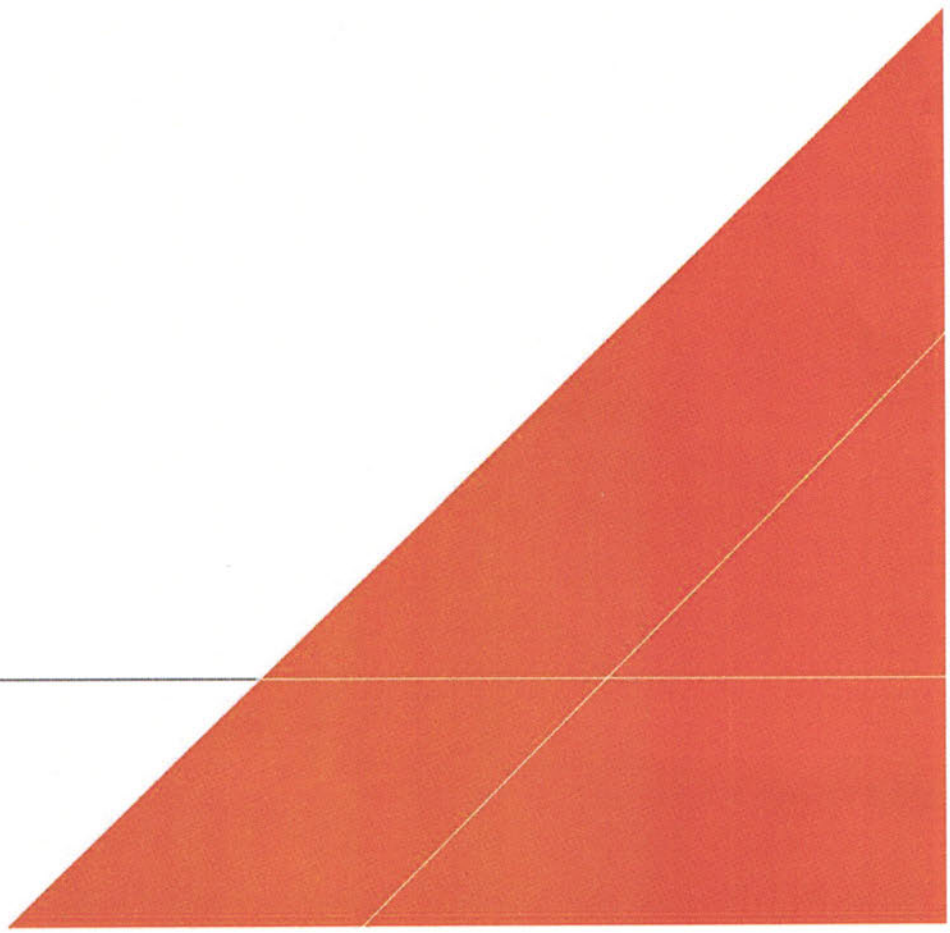
Be green, leave it on the screen.

ARCADIS Design & Consultancy for natural and built assets

SOIL PFAS INVESTIGATION - 172678

Block 22 Section 97, Charnwood ACT

23 OCTOBER 2017



Incorporating

Environmental Strategies

CONTACT

CHRIS GUNTON
Environmental Restoration Manager - ACT

T [redacted]
M [redacted]
E [redacted]@arcadis.com.au

Arcadis
Unit 5, 9 Beaconsfield St
Fyshwick, ACT

PEACH AND CO
17267

Soil PFAS Investigation

Block 22 Section 97, Charnwood ACT

Author [redacted]

Checker [redacted]

Checker [redacted]

Approver [redacted]

Report No 17267

Date 23/10/2017

Revision Text V03

REVISIONS

Revision	Date	Description	Prepared by	Approved by
V01	19/10/2017	Draft	RPS & VL	CG
V02	20/10/2017	Draft for client review	RPS	CG
V03	23/10/2017	Final	RPS	CG

CONTENTS

APPENDICES

EXECUTIVE SUMMARY

Arcadis Australia Pacific Pty Ltd (Arcadis) was commissioned by the Peach and Co Pty Ltd (Peach and Co) to complete a Soil per- and poly-fluoroalkyl substances (PFAS) Investigation at Block 22 Section 97 Charnwood ACT (herein referred to as the Site). It is understood that the site is intended to be redeveloped into a childcare facility.

A historical environmental investigation identified concentrations of PFAS within natural soils in the southern portion of the site. Due to the historical identification of PFAS at the site the ACT Health Directorate required further assessment and recommendations for any mitigation measures, focusing on areas in which children are likely to come in contact with soils (inclusive of playgrounds and landscaped areas).

The objective of this investigation was to assess the soil at the site for PFAS and assess the potential risk of PFAS to the proposed childcare centre.

Ten (10) boreholes were advanced across the site in order to assess soils for potential PFAS impacts.

Concentrations of PFOS and PFHxS (sum) exceeded the OEH residential HSL screening guidelines (0.009 mg/kg) for the following samples:

- BH1 0.05-0.15 at 0.02 mg/kg.
- BH3 0.0-0.1 at 0.06 mg/kg.
- BH6 0.0-0.2 at 0.04 mg/kg.
- BH7 0.0-0.2 at 0.74 mg/kg.
- QA1 (intra-lab duplicate for BH7 0.0-0.2) at 0.34 mg/kg.
- QA2 (inter-lab triplicate for BH7 0.0-0.2) at 0.326 mg/kg.
- BH10 0.1-0.2 at 0.9 mg/kg.

All locations were below the derived screening level of 1 mg/kg, assuming that home grown produce pathways are removed.

A preliminary risk assessment was performed and identified that with the proposed redevelopment plan, the soil ingestion exposure pathway for children is potentially complete.

Arcadis believes that the implementation of a barrier between the existing soil and occupants of the childcare centre will make the exposure pathway incomplete. The following permanent barriers will be acceptable for use to prevent exposure to soil on the site:

- Concrete pavement.
- Compacted decomposed Gravel (minimum 100mm) over geofabric.
- Synthetic turf.
- Rubber soft fall.
- Soft fall mulch (minimum 150mm) over geofabric.
- Tiles and pavers.
- Wooden decking.
- Play sand/digging pit (minimum of 400mm in depth) – Arcadis notes that a geofabric liner will be required below these areas to prevent direct contact to the underlying soils.

Any produce (e.g. fruit or vegetables) grown for consumption must be contained within elevated (400 mm) planter boxes with imported growing medium and must be placed on top of a base layer of geofabric material.

Several mature trees and general landscaping will be located within the playgrounds of the proposed redevelopment. To comply with tree protection guidelines as well as provide a

satisfactory barrier, either compacted decomposed gravel, soft fall mulch, and/or wooden decking as detailed above will be used around the base of these trees.

Based on the results of this investigation, Arcadis makes the following recommendations:

- Implement mitigation measures as described above.
- Where surface soil needs to be moved for construction purposes it should be placed under sealed hardstand areas such as the proposed carpark and or building, where possible.
- A confirmatory site inspection and review of the mitigation measure once installed should be completed. This will include a brief letter report to be provided to the ACT Health Directorate.
- No soil is to be removed from site without prior approval from the ACT EPA.
- An Environmental Management Plan (EMP) focusing on maintenance of the proposed mitigation measures and or intrusive works at the site should be prepared for the site.

Based on the implementation of the above mitigation measures, the potentially complete exposure pathway is revised to incomplete and therefore, the site would be suitable for the proposed childcare facility.

1 INTRODUCTION

Arcadis Australia Pacific Pty Ltd (Arcadis) was commissioned by the Peach and Co Pty Ltd (Peach and Co) to complete a Soil per- and poly-fluoroalkyl substances (PFAS) Investigation at Block 22 Section 97 Charnwood ACT (herein referred to as the Site). The location of the site is provided in **Figure 1, Appendix A**.

The site is the location of the former West Belconnen fire station which was vacated in 2013. The infrastructure of the former fire station was still present during the investigation. Arcadis understands that these facilities are proposed to be demolished and the site to be redeveloped into a childcare facility.

The demolition works at the site, which are approved as per the Notice of Decision (NOD) merit track dated 3rd August 2017 for the development application (DA) 201731430, are subject to several conditions which includes a condition by the ACT Health Protection Service (ACT Health Directorate) to perform further assessment due to the identification of PFAS in soils at the site in previous environmental investigations.

This condition requires additional assessment of the site and recommendations for any mitigation measures that may be necessary, focusing on areas in which children are likely to come in contact with soils (inclusive of playgrounds and landscaped areas). Arcadis understands that prior to the ACT Health Directorate receiving and endorsing these works, that the NOD merit track approval will not take effect and that demolition works are unable to proceed.

The intention of this investigation is to assess areas in which children are likely to come in contact with site soils (inclusive of playgrounds and landscaped areas) for PFAS as well as to provide mitigation measure where required.

1.1 Background

PFAS containing aqueous film forming foam (AFFF) was initially identified as having been use and stored at the site within an environmental investigation report by AECOM titled, 'Stage 1 Environmental Assessment – JACSD Charnwood' dated 18th November 2014. It was noted in this report that a small quantity of AFFF (an unspecified number of 20L drums) was stored in an internal store room for use in the foam tanks of fire engines as required.

Several environmental assessments were subsequently completed at the site, however PFAS was only analysed within soil samples as a part of one report. The results of the PFAS analyses were presented in a letter report titled, 'Excavated Soils, Block 6, Section 97, Former Belconnen Fire Station, Charnwood, ACT, Validation Letter' dated 30th April 2015.

As a part of this investigation, three (3) soil samples were selected for PFAS analysis. The samples were located in the south-eastern corner of the site which coincided with soil impacted with total recoverable hydrocarbon (TRH) that had been excavated to a depth of 0.3 metres below ground level (m bgl) and stockpiled on site within an open shed.

The measured concentrations of PFAS in these samples are tabled below.

Table 1-1 AECOM (2015B) Soil PFAS Concentrations

Analyte	VS01	VS02	VS03
Perfluorooctane sulphonate (PFOS)	1.30 mg/kg	1.30 mg/kg	1.92 mg/kg
Perfluorooctanoic acid (PFOA)	0.0039 mg/kg	0.0048 mg/kg	0.0061 mg/kg

Since the submission of this letter report (30th April 2015) by AECOM (AECOM 2015B), the guidance regarding acceptable analytical concentrations for PFAS have been amended as well as the analytical methodologies used by laboratories for analysing PFAS. Therefore, as part of the site's current Notice of Decision (NOD) merit track, the ACT Health Directorate have requested that additional, and up to date assessment for the site for PFAS is completed.

The sample locations for VS01, VS02, and VS03 are provided in **Appendix A, Figure 2**.

1.2 Objective

The objective of this investigation was to assess the soil at the site for PFAS and assess the potential risk of PFAS to the proposed childcare centre.

1.3 Scope of Works

The scope of work for the investigation was as follows:

- Perform a review of specifically regarding PFAS for previous environmental investigations for the site.
- Supervise ten (10) targeted soil boreholes to a maximum depth of between 3 m bgl or 0.5m into natural material.
- Each soil sample was logged in general accordance with the Unified Soil Classification System (USCS).
- Ten (10) primary soil samples were submitted to a National Association of Testing Authorities (NATA) accredited laboratory for selective analysis of the following contaminants of potential concern (COPCs):
  - Standard PFAS analysis.
  - Total Oxidisable Precursor (TOP) Assay PFAS (five (5) samples only).
- Quality assurance / quality control (QA/QC) analysis for soil samples, consisting of 1:20 duplicates and triplicates was performed.
- Results were compared against the most relevant provided within the PFAS National Environment Management Plan, consultation draft (August 2017).
- Preparation of this report which presents the findings and recommended mitigation options where required. The report has been prepared in general accordance with the ACT EPA endorsed requirements stated in the NSW Office of Environment and Heritage (2011) 'Guidelines for Consultants Reporting on Contaminated Sites'.

1.4 Limitations

The findings of this report are based on the scope of work outlined in **Section 1.3**. Arcadis performed its services in a manner consistent with the normal level of care and expertise exercised by members of the environmental assessment profession. No warranties, expressed or implied are made.

Subject to the scope of work, Arcadis' assessment was limited strictly to identifying the environmental conditions associated with the subject property and does not include evaluation of any other issues. The absence of any identified hazardous or toxic materials should not be interpreted as a guarantee that such materials do not exist on the subject property.

Additionally, unless otherwise stated Arcadis did not conduct soil, air, wastewater or other matrix analyses including asbestos or perform sampling of any kind. Nor did Arcadis investigate any waste material from the property that may have been disposed of at the site, or undertake an assessment or review of related site waste management practices.

The results of this assessment are based upon (if undertaken as part of the scope work) a site inspection conducted by Arcadis personnel and/or information from interviews with people who have knowledge of site conditions and/or information provided by regulatory agencies. All conclusions and recommendations regarding the property are the professional opinions of the Arcadis personnel involved with the project, subject to the qualifications made above.

All conclusions and recommendations regarding the property are the professional opinions of the Arcadis personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, Arcadis assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements or sources outside of Arcadis, or developments resulting from situations outside the scope of this project.

Arcadis is not engaged in environmental assessment and reporting for the purpose of advertising sales promoting, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity purposes. The client acknowledges that this report is for the exclusive use of the client.

2 SITE CHARACTERISTICS AND SITE HISTORY

2.1 Site Location

The site is the location of the former West Belconnen fire station. The site is accessed from Lhotsky Street to the north. Details of the site are summarised in **Table 2-1**.

The site location and site layout are presented in **Figure 1**, and **Figure 2**, **Appendix A**.

Table 2-1 Site Detail Summary

Site Characteristic	Detail
Street Address	35 Lhotsky Street, Charnwood, ACT
Approximate Coordinates	35°20'4388" S 149°02'8505" E
Approximate Elevation (m AHD)	537
Block, Section, Division	Block 22 Section 97 Charnwood ACT
Land Zoning	CF – Community Facilities
Current Land use	Former West Belconnen fire station
Site Area (approximately)	3,600 m^2

2.2 Site Description

A description of the site based on the observations made during a site visit completed on 3rd October 2017 by Ryan Stewart who is a suitably qualified environmental scientist from Arcadis is summarised below:

- There is one (1) building in the northern section of the site which encompasses the former offices and indoor parking area for fire trucks. An open shed is located in the southern portion of the site.
- The drill yard, along with other parking facilities is located south of the main building and is covered in bitumen. The bitumen surface was observed to be in moderately poor condition with multiple cracks and intrusions where historical test pits and boreholes had been performed.
- Grassed and landscaped areas are located around the peripheries of the site in all directions.
- The site was observed to be flat with no general slope observed.
- A stockpile of soil was observed within the open shed in the southern portion of the site.
- The area identified as having been excavated within the AECOM 2015 letter report was observed within the south-western portion of the site.

2.3 Surrounding Land Uses

The following surrounding land uses were noted at the time of site works:

- North – Lhotsky Street is located immediately north of the site, on the opposite side of which is an open sporting field assumed to belong to Brindabella Christian College.
- South – Ginninderra Christian Church is located immediately adjacent to the southern boundary of the site.
- West - Adjacent to the western boundary of the site is Florey Drive, on the opposite side of which is a sports field.
- East – St Thomas Aquinas Primary School is located adjacent to the east boundary.

2.4 Sensitive Environments

The nearest sensitive environment is the St Thomas Aquinas Primary School immediately adjacent to the site's eastern boundary.

No surface water features are located within a 500 m radius of the site.

2.5 Proposed Land Use

Arcadis understands that the site may be redeveloped into a childcare facility is noted to be one of the most sensitive land uses.

3 PREVIOUS INVESTIGATIONS

A list of the previous environmental Investigations for the site is provided below:

- AECOM 2014, Stage 1 Environmental Assessment – JACSD, Charnwood, 18th November 2014 (AECOM 2014A).
- AECOM 2014, Remedial Action Plan, Former West Belconnen Fire Station, 3rd March 2017 (AECOM 2014B).
- AECOM 2014, UPSS Validation Report – Former West Belconnen Fire Station, Belconnen, ACT, 18th November 2014 (AECOM 2014C).
- AECOM 2015, DRAFT Former Charnwood Fire Station: Stage 2 Environmental Site Assessment Report, 13th March 2015 (AECOM 2015A).
- AECOM 2015, Excavated Soils - Block 6, Section 97, Former West Belconnen Fire Station, Charnwood, ACT – Validation Latter, 30th April 2015 (AECOM 2015B).
- AECOM 2015, Block6, Section 97 Charnwood, ACT – Summary of Previous Investigations and Site Suitability Status, 17th July 2015 (AECOM 2015C).

A brief review of each of the above reports is provided below.

3.1 AECOM 2014, Stage 1 Environmental Assessment – JACSD, Charnwood, 18th November 2014 (AECOM 2014A)

The objective of the Phase I environmental site assessment (ESA) was to assess for potential soil and/or groundwater contamination issues that may require further investigation and/or management prior to potential Territory Plan Variation to a more sensitive land use.

A summary of the potentially contaminating activities at the site are as follows:

- The presence of fuel dispensers and underground storage tanks (USTs) and associated infrastructure.
- Onsite septic tanks and/or septic lines.
- Potential contamination associated with the use and storage of AFFF.
- Potential contamination associated with the maintenance of fire engines
- Fill material of unknown origin potentially present:
  - Underneath building structures.
  - Access driveways.
  - Within the USTs and fuel lines.
- Potential asbestos associated with building structures.

The following Contaminates of Potential Concern (COPCs) were provided:

Table 3-1 COPCs

COPC	Rationale/Comment
Heavy Metals	May occur in fill material of unknown origin, and can be associated with deterioration of stored metal products, general workshop activities.
TRH	Fuel leaks from underground fuel storage tanks.
Benzene, toluene, ethylbenzene, xylenes (BTEX)	May have been introduced into the soil and groundwater in the immediate vicinity of the underground fuel storage tanks. May occur in fill material of unknown origin.

COPC	Rationale/Comment
Polycyclic aromatic hydrocarbons (PAHs)	PAH are also potentially present in fill of unknown origin. Related to some petroleum hydrocarbons, such as waste and lubricating oils and diesel fuel, bitumen/asphalt.
PFOA and PFOS	have historically been used to make aqueous film forming foam (AFFF), a component of fire-fighting foams.
Polychlorinated biphenyls (PCB)	Historically present in electrical equipment such as transformers. Can be present in fill of unknown origin.
Volatile Halogenated Compounds (VHC)	Related to solvent use, such as degreasers and 'thinners'.
Asbestos	Site buildings and can be present in fill materials containing demolition wastes. Can be present as conduits for underground services.
Biological Contamination	Typically associated with degrading biological material such as degrading faecal matter within onsite septic tanks.

Based on the Phase I ESA, a Phase 2 ESA was recommended. The following areas of environmental concern (AECs) were recommended to be targeted:

- Three (3) USTs, within the central eastern portion of the site.
- Car wrecks, stored in the southern car park section of the site, adjacent to the open shed.
- 20L drums of AFFF which were stored in the internal store room (off the engine bay)
- Uncontrolled fill which may be present at the site, near the southern fence line.
- Soil around the building footprint.

Groundwater monitoring was additionally recommended in the event of COPCs being identified in soil samples.

It is further noted the three (3) USTs and their associated infrastructure had been decommissioned at the time that this Phase I ESA had been submitted.

3.2 AECOM 2014, Remedial Action Plan, Former West Belconnen Fire Station, 3rd March 2017 (AECOM 2014B).

The objective was to present a plan of the anticipated remediation works for the removal of existing onsite USTs and related fuel dispensing infrastructure.

Arcadis notes that the guidelines adopted for the RAP were for Commercial/Industrial land use purposes.

The following staged approach was proposed:

- Stage 1: Engagement of an Environmental Office
- Stage 2: Environmental Controls
- Stage 3: Service Location across the Site
- Stage 4: Excavation and Removal of Underground Storage Tanks
- Stage 5: Excavation of Impacted Soils and Validation of Tank Pits
- Stage 6: Sampling of Stockpiles
- Stage 7: Imported Fill Sampling

The RAP stated that the remedial works would not provide an overall assessment of the suitability of the site and that remedial works only related to the onsite fuel storage and dispensing area.

3.3 AECOM 2014, UPSS Validation Report – Former West Belconnen Fire Station, Belconnen, ACT, 18th November 2014 (AECOM 2014C).

The objective of this investigation was to remove the underground petroleum storage system (UPSS) and to validate the excavation in accordance with the RAP (AECOM 2014B). The objective within the report notes that the sampling performed was for validation works of UPSS excavations only and not the wider site.

AECOM understands that the Territory is proposing to submit a Territory Plan Variation to change the land use to Community Facility Zone (CFZ) with potential for a childcare centre.

The following fieldwork program for these works is tabled below.

Table 3-2 Fieldwork Program

Date	Fieldwork Activity	Comment
25-26 August 2014	EPS removed USTs, fill, and natural material.	N/A
27 August 2014	AECOM inspect the works to validate excavation extent, characterise stockpiles and address compliance with environmental protection measures on the Site	N/A
04 September 2014	AECOM inspect 100 m 3 of ENM stockpiles at Boral Quarry, Kaveneys Road, Hall, NSW that EPS proposed for import to Site for use as backfill.	ENM at Boral Quarry classified as suitable for the proposed future land use low density residential with childcare.
10 September 2014	AECOM issue Waste Classification Letter to JACSD to accompany all stockpiled material proposed for disposal off-Site	Stockpiles classified as S*olid Waste* under ACT Waste Guidelines
	EPS remove all stockpiles from Site for disposal at Veolia ES – Woodlawn Landfill, Collector Road, Tarago, NSW.	A total of 70.06 t of material transported to Woodlawn Landfill
25 September 2014	EPS import 32 t of ENM from Boral Quarry to backfill the excavations. AECOM confirm compliance with ENM characterised on 4 September 2014.	ENM filled and compacted in 300 mm layers in excavations. Site swept and tidied by EPS

AECOM noted that all sampling and analysis for the UPSS validation works were completed in accordance with the AECOM RAP (AECOM 2014B). However, it is noted that validation samples, stockpile samples (excluding material identified as waste), and imported excavated natural material (ENM) soil samples were all screened against low-density residential as opposed to commercial/industrial as posed within the RAP.

The following is a summary of the AECOM discussion section:

- Twenty-one (21) soil samples (including QA/QC) were collected for validation purposes from natural materials surrounding the USTs and within a close proximity to other UPSS infrastructure. Laboratory analysis of all samples collected reported concentrations of all COPCs less than the laboratory Limit of reporting (LOR) and/or adopted low density residential guidelines. Based on field observations made during validation works and laboratory analysis, AECOM considers that the site has been appropriately validated with no residual contamination associated with previous fuel storage infrastructure within the Site.

- Thirteen (13) soil samples (including QA/QC) were collected from approximately 96 m^3 of excavated fill materials surrounding the USTs. Laboratory analysis of each sample returned concentrations of all COPCs less than the laboratory LOR and/or adopted low density residential guidelines with the exception of:
  - TRH C6-C10 less BTEX concentrations exceeding the adopted low density residential guidelines in three (3) samples.
  - TRH C10-C16 less naphthalene concentrations exceeding the low density residential guidelines in four samples collected.
- Excavated materials were transported to Horsley Park Waste Management Facility, which is licenced to receive restricted solid waste. AECOM considered that based on the laboratory analysis of collected stockpile samples and collated waste disposal documentation, that the fill materials excavated from the Site have been appropriately characterised and disposed of.
- Five (5) soil samples (including QA/QC) were collected from the approximately 32 tonnes (t) of imported ENM material to ensure the suitability of the material for on-site use to fill each excavation. Laboratory analysis of all samples collected reported concentrations of all CoPCs less than the laboratory LOR and/or adopted low density residential guidelines. Based on field observations made during ENM fill inspection and laboratory analysis of collected characterisation samples, AECOM considers that the imported ENM material is suitable for use within the Site and does not pose a risk to human health or the environment.

The report concludes that that validation of the UPSS excavation was completed to a standard acceptable for the proposed future land use i.e. Community Facility Zone (CFZ) with potential for a childcare centre.

3.4 AECOM 2015, DRAFT Former Charnwood Fire Station: Stage 2 Environmental Site Assessment Report, 13th March 2015 (AECOM 2015A).

The objectives of these works were to investigate five (5) areas of environmental concern (AECs) which were previously identified in AECOM Phase I ESA (AECOM 2014A) and to assess the potential presence and evaluate any risks posed by the AECs to the proposed future childcare centre land use.

The AECs identified are listed below:

- AEC 1 - Three (3) USTs, within the central eastern portion of the site. The site UPSS had been decommissioned and the tank pits have been assessed and validated in AECOM 2014C.
- AEC 2 - Car wrecks, stored in the southern car park section of the site, adjacent to the open shed.
- AEC 3 - 20L drums of AFFF which were stored in the internal store room (off the engine bay). Based on AECOM's Phase 1 ESA AECOM considers the site to have unlikely been affected by AFFF. Therefore, the analysis of AFFF was not undertaken for these works.
- AEC 4 - Uncontrolled fill which may be present at the site, near the southern fence line.
- AEC 5 – Onsite septic tanks and/or septic lines.

The soil assessment criteria selected for the site were suitable for the proposed site use as a child care facility. This included:

- HIL A (Low Density Residential).
- Vapour intrusion –Soil HSL A (Low/High Density Residential) – Sand.
- Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) Technical Report No.10 - HSLs for direct contact to soil.Direct Contact –HSL A.

- United States Environmental Protection Agency (US EPA) (January, 2015) - Regional Screening Levels (RSLs) – Residential Soil (US EPA, 2015).

Twenty (20) soil samples inclusive of (QAQC) samples were collected from three (3) soil bores, nine (9) test pits and one (1) hand auger location. Samples were analysed for the following COPCs:

- Heavy metals.
- Asbestos.
- TRH.
- BTEX.
- PAHs.
- Phenols.
- Organochlorine and organophosphorus pesticides (OCP/OPPs).
- PCBs.

The soil analytical results indicated no exceedances of the site assessment criteria with the exception of sample TP05_0.0-0.1 for TRH C10-C16 (less naphthalene) at 190 mg/kg which exceeded the site assessment criterion of 110 mg/kg.

The Stage 2 ESA identified fill materials typically 0.5 m bgl to a maximum of 2.0 m bgl within the former UST area (AEC 01). Natural soil conditions across the Site to comprise sandy clay soils. No visual or olfactory observations of contamination impact were noted across the boreholes, test pits and hand auger locations.

The data set collected during the Stage 2 ESA was screened against criteria for the land use scenario of a childcare centre. One sample (TP05_0.0-0.1), located adjacent to the former vehicle maintenance shed in the south east unsealed corner of the Site, exceeded these criteria and indicates low-level impact. All other samples obtained from the AECs were below the criteria for all analytes for childcare centre usage.

The report concludes that based on the targeted sampling and analysis completed at the Site, AECOM considers the five nominated AECs to have been adequately characterised in relation to risks to future proposed receptors at the Site. The report recommends however that remedial action via targeted removal and validation of the surface soils in AEC01 in the immediate vicinity of sample location TP05 is recommended to address the identified potential exposure pathways (and risk) for the proposed childcare facility development on the Site.

3.5 AECOM 2015, Excavated Soils - Block 6, Section 97, Former West Belconnen Fire Station, Charnwood, ACT – Validation Letter, 30th April 2015 (AECOM 2015B).

The objective of this report was to assess soils, remaining after TRH-impacted material around TP05 was excavated, were suitable for the proposed future childcare centre land use.

An excavation of approximately 7m wide, 5m long, and 0.3 deep was performed around soil sample the historical sample location TP05. This material was stockpiled within the open site shed. Three (3) soil validations samples were collected from the base of the excavation and analysed for the following COPCs:

- Heavy metals.
- Asbestos.
- TRH.
- BTEX.
- PAHs.

- OCP/OPPs.
- PCBs.
- PFOS and PFOA.

The soil assessment criteria selected for the site were suitable for the proposed site use as a child care facility. This included:

- HIL A (Low Density Residential).
- Vapour intrusion –Soil HSL A (Low/High Density Residential) – Sand.
- Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) Technical Report No.10 - HSLs for direct contact to soil. Direct Contact –HSL A.
- United States Environmental Protection Agency (US EPA) (January, 2015) - Regional Screening Levels (RSLs) – Residential Soil (US EPA, 2015).
- US EPA Region 4 (2009) – Soil Screening Levels for PFOS and PFOA.

Analytical results showed concentrations of all COPCs below the selected soil assessment guidelines.

It is however noted the all soil samples reported concentrations of both PFOS and PFOA above laboratory LORs. These are tabled above in **Table 1-1**.

AECOM concluded that the validation of the TP05/AEC04 excavation was completed to a standard acceptable for the proposed future child care land use. No recommendations were provided within this report.

3.6 AECOM 2015, Block6, Section 97 Charnwood, ACT – Summary of Previous Investigations and Site Suitability Status, 17th July 2015 (AECOM 2015C).

The objectives of this report were to:

- Assess the potential for site-derived groundwater impacts and whether interim on-going environmental management is required.
- Provides a clear statement regarding the suitability of the Site for its proposed land use.

Though groundwater was not directly assessed at the site a Tier 1 risk assessment, consistent with the National Environment Protection Council (1999) National Environment Protection Measure (NEPM) 1999 as amended 2013 Schedule B9, considers groundwater to not be at risk for site activities because:

- Groundwater was not encountered during intrusive works to a maximum depth of 8m bgl.
- Natural soils are low permeability tight clays and, under the low density residential land use with childcare centres, the appropriate criteria for volatile contaminants (ASC NEPM, HSL-A) at a site with groundwater greater than 8 m and soil samples greater than 4 m in clay are all not limiting with the exception of benzene and TRH C_6-C_{10} F1 (less BTEX).
- Soil samples analysed during previous assessments did not report any concentrations of volatile hydrocarbons above the laboratory LORs at the base of the former tanks (approximately 4 m bgl) and in the soils beneath (between 4 m and 8 m bgl). Furthermore, field screening at the time of sampling did not note any elevated PID readings (less than 10 ppm) and "out-of-ground" tank inspections did not observe any visible leaks/penetrations.

On this basis AECOM stated that neither interim or ongoing environmental management of groundwater was warranted.

Regarding site suitability and after a review of historical works AECOM stated the site could be capable of supporting a CFZ land use with potential for a child care.

4 SITE CONDITION AND ENVIRONMENTAL SETTING

4.1 Topography

The digital topographic map presented in ACTMAPi (available http://www.actmapi.act.gov.au/) indicates that the site has an elevation of approximately 537 m above the Australian Height Datum (AHD).

Based on observations during the site investigation, the site is generally flat.

4.2 Soils and Geology

The former NSW Department of Environment, Climate Change and Water 2010 soil landscape series – sheet 8727, indicates the site is underlain by the Williamsdale soil formation comprised of undulating rises, fans, valley flats and depressions on Silurian Volcanics of the Canberra Lowlands.

The soils are characteristically moderately deep, moderately well-drained Yellow Chromosols on Red and Brown Kandosols on upper rises and fan elements. Moderately to very deep, poorly to imperfectly drained Sodosols are reported on lower rises and fan elements.

A small area to the west of the Site is characterised as Burra soil formation. This is characterised by undulating to rolling low hills and alluvial fans on Silurian volcanics.

The soils identified during intrusive works by Arcadis include:

- Fill material, encountered at the majority of sample location with the exception of BH2, BH4 and BH7 and varied from surface to 0.6m bgl in depth. Fill material was described as:
  - Road base, gravelly clay, silty gravel, clayey gravelly silt. At all locations, the fill material was dry.
- Natural soils at the site were described as:
  - Silty Sandy Clay, and Silty clays with trace sands. Natural soils ranged from red to brown with grey and red mottling. The soils were additionally, cohesive, roots were observed, ranged from humid to dry, and were stiff.
- Bedrock was not encountered by Arcadis.

Detailed borelogs are provided in **Appendix B**, while Arcadis sampling locations are provided in **Figure 3, Appendix A**.

Soils and fill material identified by Arcadis are generally consistent with that of previous investigations.

4.3 Hydrogeology

A groundwater bore search was performed in AECOM's Phase I ESA (AECOM 2014A). The findings of this indicated that no registered groundwater bores were identified within a 1 km radius of the Site.

No groundwater investigations were performed at the site, however a tier one risk assessment, consistent with the NEPM Schedule B9 performed by AECOM (2015C) considers groundwater to not be at risk for site activities. The tier one risk assessment concluded that neither interim or ongoing environmental management of groundwater was warranted for the site due to:

- Groundwater not being encountered within the maximum intrusive depth of 8m bgl.
- Natural soils are low permeability tight clays and, under the low density residential land use with childcare centres, the appropriate criteria for volatile contaminants (ASC NEPM, HSL-A) at a site with groundwater greater than 8 m and soil samples greater than 4 m in clay are all not limiting with the exception of benzene and TRH C_6-C_{10} F1 (less BTEX).

- Soil samples analysed during previous assessments did not report any concentrations of volatile hydrocarbons above the laboratory LORs at the base of the former tanks (approximately 4 m bgl) and in the soils beneath (between 4 m and 8m bgl). Furthermore, field screening at the time of sampling did not note any elevated PID readings (less than 10 ppm) and "out-of-ground" tank inspections did not observe any visible leaks/penetrations.

4.4 Hydrology

The nearest surface water receptor is a tributary to the Ginninderra Creek which is located approximately 0.6 km southwest of the site.

Surface water runoff is expected to be directed by engineered flow paths into a general stormwater system.

4.5 Visible Signs of Contamination

No visible indications of gross contamination were observed during site works performed by Arcadis.

4.6 Odours

During intrusive works performed by Arcadis no hydrocarbon/chemical/sweet odours were identified.

5 AREAS OF ENVIRONMENTAL CONCERN

The following AECs were identified by AECOM (AECOM 2015A) within historical investigations:

- AEC 1 - Three (3) USTs, within the central eastern portion of the site (decommissioned).
- AEC 2 - Car wrecks, stored in the southern car park section of the site, adjacent to the open shed.
- AEC 3 - 20L drums of AFFF which were stored in the internal store room (off the engine bay).
- AEC 4 - Uncontrolled fill which may be present at the site, near the southern fence line.
- AEC 5 - Onsite septic tanks and/or septic lines.

These historical AEC locations are provided within **Figure 2**, **Appendix A**.

5.1 AEC 1 - Three (3) USTs

UPSS decommissioning and validation works were performed by AECOM (AECOM 2014C) in accordance with the site-specific RAP (AECOM 2014B). The following is a summary of the validation report (AECOM 2014C):

- soil samples collected for validation purposes from natural materials surrounding the USTs and within a close proximity to other UPSS infrastructure reported concentrations of all COPCs (BTEX, TRH, Heavy Metals, and Asbestos) less than the laboratory LORs. AECOM considered that the site has been appropriately validated with no residual contamination associated with previous fuel storage infrastructure within the Site.
- soil samples collected from approximately 96 m3 of excavated fill materials surrounding the USTs returned concentrations of all CoPCs (BTEX, TRH, Heavy Metals and Asbestos) less than the laboratory LORs and/or adopted low density residential guidelines with the exception of:
  - TRH C6-C10 less BTEX concentrations exceeding the adopted low density residential guidelines in three (3) samples.
  - TRH C10-C16 less naphthalene concentrations exceeding the low density residential guidelines in four (4) samples collected.
- Excavated materials were transported to Horsley Park Waste Management Facility, which is licenced to receive restricted solid waste. AECOM considered that based on the laboratory analysis of collected stockpile samples and collated waste disposal documentation, that the fill materials excavated from the Site have been appropriately characterised and disposed of.
- Soil samples collected from the imported ENM material reported concentrations of all CoPCs (TRH, BTEX, PAHs, Heavy metals, OCP/OPPS, PCBs, and Asbestos) less than the laboratory LOR and/or adopted low density residential guidelines. AECOM considered that the imported ENM material is suitable for use within the Site and does not pose a risk to human health or the environment.

The report concluded that that validation of the UPSS excavation was completed to a standard acceptable for the proposed future land use i.e. Community Facility Zone (CFZ) with potential for a childcare centre. Arcadis agrees with AECOM's conclusion after a review of the UPSS validation report.

5.2 AEC 2 and 4 – Car Wrecks and Uncontrolled Fill.

Soil samples collected from across the site within the Phase 2 ESA (AECOM 2015A) within both natural and fill materials were analysed for the following COPCs:

- Heavy metals.
- Asbestos.

- TRH.
- BTEX.
- PAHs.
- Phenols.
- Organochlorine and organophosphorus pesticides (OCP/OPPs).
- PCBs.

The samples were compared to the following soil assessment criteria:

- HIL A (Low Density Residential).
- Vapour intrusion –Soil HSL A (Low/High Density Residential) – Sand.
- Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) Technical Report No.10 - HSLs for direct contact to soil. Direct Contact –HSL A.
- United States Environmental Protection Agency (US EPA) (January, 2015) - Regional Screening Levels (RSLs) – Residential Soil (US EPA, 2015).

Fill across the site has been identified from surface to a maximum depth of 2.0m bgl within the former UST. No visual or olfactory observations of contamination impact were noted across the historical and recent boreholes, test pits, and hand auger locations.

The soil analytical results indicated no exceedances of the site assessment criteria with the exception of sample TP05_0.0-0.1 for TRH C10-C16 (less naphthalene) at 190 mg/kg which exceeded the site assessment criterion of 110 mg/kg.

An excavation of approximately 7m wide, 5m long, and 0.3 deep was performed around soil sample TP05_0.0-0.1 by AECOM (AECOM 2015B). This material was stockpiled within the open site shed, where it remains to date. Three (3) soil validations samples were collected from the base of the excavation and analysed for the same analytical suite provided above, with the addition of PFOS and PFOA. Analytical results for the validation works showed concentrations of all COPCs below the selected soil assessment guidelines. It is however noted that PFOS and PFOA concentrations were identified above the laboratory LORs, this is discussed below in **Section 5.3**.

Arcadis believes that the fill material at the site has been sufficiently assessed regarding the above COPCs, excluding PFOS and PFOA, and poses a low risk. It is however noted that a stockpile of historically impacted material remains at the site within the site shed.

5.3 AEC 3 - AFFF

Though identified within the AECOM's Phase I (AECOM 2014A) only three (3) samples were assessed for PFAS (AECOM 2015B). These samples were collected from the base of the of the 7m wide, 5m long, and 0.3 deep excavation performed to remediate AEC 4. It is however noted that this stockpile remains at the site within the site shed. The concentrations are tabled above in Table 1-1.

Arcadis notes that the extent of PFAS impact at the site is unknown. Additionally, since the submission of this letter report (18th November 2014) the guidance regarding acceptable analytical concentrations for PFAS have been amended as well as the analytical methodologies used by laboratories in assessing sample for PFAS.

Due to the proposed redevelopment of the site into a child care facility additional assessment of the site and mitigation measure, focusing on areas in which children are likely to come in contact with site soils (inclusive of playgrounds and landscaped areas) is required.

5.4 AEC 5 – Onsite septic tanks and/or septic lines.

After a review of previous AECOM environmental reports Arcadis can find no evidence to support the existence of a septic tank and or associated infrastructure to exist at the site. Furthermore, during intrusive works as well as a site inspection Arcadis was not able to locate a septic tank and or associated infrastructure. It is further noted that part of the sewer network enters the site boundary after a review of the Icon Water sewer network figure. The sewer gattic cover was additionally identified during service location works performed at site.

Arcadis therefore believes that it is unlikely that a septic tank and or associated infrastructure is located at the site.

5.5 Contaminants of Potential Concern

Based on the above the COPCs are summarised in **Table 5-1** below.

Table 5-1 AECs and COPCs

AEC	Description	COPCs
1	Stockpiled soil	TRH and PFAS
2	Areas in which children are likely to come in contact with site soils (inclusive of playgrounds and landscaped areas)	PFAS

6 DATA QUALITY OBJECTIVES AND SAMPLING AND ANAYSIS PLAN

This section outlines the methodology adopted by Arcadis during the intrusive works conducted as part of the investigation. This section also provides details on the sampling and analysis, rationale for borehole locations, description of field equipment used, decontamination procedures, field and laboratory quality assurance and control, laboratory analytical methods and sample preservation.

6.1 Data Quality Objectives (DQO)

The DQO process is a systematic planning tool based on the scientific method for establishing criteria for data quality and for developing data collection designs. The DQO defines the experimental process required to test a hypothesis. The DQO process has been developed to ensure that efforts relating to data collection are cost effective, by eliminating unnecessary, duplicative or overly precise data whilst at the same time, ensuring the data collected is of sufficient quality and quantity to support defensible decision making.

It is recognised that the most efficient way to accomplish these goals is to establish criteria for defensible decision making before data collection begins and develop a data collection design based on these criteria. By using the DQO process to plan the investigation effort, the relevant parties can improve the effectiveness, efficiency and defensibility of a decision in a resource and cost effective manner.

The DQO process consists of seven steps, which are designed to clarify the study objectives, define the appropriate type of data and specify tolerable levels of potential decision errors. The seven-step DQO process adopted for this DSI can be summarised as follows:

- Step 1: State the Problem – concisely describe the problem to be studied. Review prior studies and existing information to gain a sufficient understanding to define the problem;
- Step 2: Identify the Decision – identify what questions the study will attempt to resolve, and what actions may result;
- Step 3: Identify the Inputs to the Decision – identify the information that needs to be obtained and the measurements that need to be taken to resolve the decision statement;
- Step 4: Define the Study Boundaries – specify the time periods and spatial area to which decisions will apply. Determine when and where data should be collected;
- Step 5: Develop a Decision Rule – define the statistical parameter of interest, specify the action level, and integrate the previous DQO outputs into a single statement that describes the logical basis for choosing among alternative actions;
- Step 6: Specify Tolerable Limits on Decision Errors – define the decision maker's tolerable decision error rates based on a consideration of the consequences of making an incorrect decision; and
- Step 7: Optimise the Design –evaluate information from the previous steps and generate alternative data collection designs. Choose the most resource-effective design that meets all DQOs.

The DQOs are provided in Table 6-1 and were derived in accordance with Australian Standard 4482.1-2005 'Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds' (AS 4482.1-1997).

Table 6-1 Site Specific DQOs

Step	Detail
State the Problem	To target soil at the site (to the extent practicable) which children are likely to come in contact with (inclusive of playgrounds and landscaped areas) and to make recommendations as to: • Suitability of the site for the proposed childcare facility. • Mitigation methods (if required).
Identify the Decision	If elevated concentrations of COPCs were identified at the site: • What is the extent of the impact? • Do any COPC at the site occur at concentrations that pose or may pose an unacceptable liability or risk to the environment and/or human health to persons who will utilise the future development? • If so what is the order of priority to minimise the risk and what additional measures are required to mitigate, remediate, or manage the risk?
Identify the Inputs to the Decision	Key data required to resolve the project problem including concentrations of COPCs in the surface soils collected in the study area. The COPCs selected, provided in **Table 5-1** were based on historical review (**Section 3**) and the site condition observed during recent fieldworks. The guidelines adopted by Arcadis to assess the soil results are as follows. **Soil:** The following criteria has been adopted from the PFAS National Environmental Management Plan, consultation Draft (August 2017): • HSL – Based on ASC NEPM HIL-A, assumptions with home grown produce included. Further to this the NEPM HILs calculator has been used to calculated the HIL-A for the site whit the home grown produce excluded for the site. Further explanation for the selection of these criteria is provided below in **Section 8** below.
Define the Study Boundaries	This investigation was restricted to the physical site boundaries, as shown in **Figure 2 Appendix A.** The vertical extent of the study boundaries was limited to a maximum depth of 2.0m bgl. The temporal boundaries of the study were limited to the date that the investigations were completed listed in **Section 6.2**.
Develop a Decision Rule	If the concentrations of COPCs in the soil sample are reported to be below the relevant adopted guidelines, then the soil will be deemed suitable and no mitigation/management/remediation options will be proposed for continued land use at the site. If however, the concentration of one or more COPCs are greater than the guidelines recommendations will be made for the mitigation/remediation/management of contamination to render the site suitable for the proposed use.
Specify Tolerable Limits on Decision Errors	The acceptable limits for samples are as follows: • % RPD for laboratory duplicates for TPH and BTEX analysis is less than 60%; and • Recovery of matrix spikes and surrogate spikes is as per the laboratory's Quality Assurance targets accepted under their National Association of Testing Authorities (NATA) accreditation.

Step	Detail
	Precision is measured using the standard deviation 'SD' or Relative Percent Difference '%RPD'. Replicate data for field duplicates of organics is expected to be as follows: • RPD criteria of 50% or less, for concentrations > or = 10 times practical quantitation limits (PQL); • RPD criteria of 75% or less, for concentrations between 5 and 10 times the EQL; and • RPD criteria of 100% or less, for concentrations < 5 times PQL. Replicate data for field duplicates for inorganics, including metals is expected to be as follows: • RPD criteria of 30% or less, for concentrations > or = 10 times PQL; • RPD criteria of 75% or less, for concentrations between 5 and 10 times the EQL; and • RPD criteria of 100% or less, for concentrations < 5 times PQL. Where acceptable limits for field duplicates were not met, a discussion on low biased error will be provided.
Optimise the Design	Soil samples were targeted at surface soils using a layout of the proposed childcare facility. Additionally, samples were collected at relevant intervals, changes in geology or in zones of gross contamination (if observed), and locations selected for efficient and representative sampling.

6.2 Chronology of Works

A summary of site activities completed is provided in **Table 6-2** below.

Table 6-2 Chronology of Works

Date	Description of Site Activities
22nd August 2017	Drilling soil bores BH1 through to BH10.

6.3 Sampling Analysis Plan and Sampling Rationale

The intention of the sampling plan was to attain the objectives stated in **Section 1.2**. Sampling locations were based on an established site history as well as being strategically placed across the site to target soil at the site (to the extent practicable) which children are likely to come in contact with (inclusive of playgrounds and landscaped areas).

Ten (10) sample locations in total were advanced across the site during Arcadis' field works. While *Australian Standard (AS) 4482.1* – 2005 *Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soil Part 1: Non-volatile and Semi-Volatile Compounds* recommends between nine (9) and eleven (11) sampling points to characterise a site of this size (3,600m^2). The sampling plan performed at the site is considered suitable to achieve the objectives of the project.

Table 6-3 Chronology of Works

Sample	Current Location	Location on Proposed Redevelopment
BH1	Below entrance/exit to site and fire station.	Playground.
BH2, BH3, and BH4	Landscaped area.	Playground.
BH5	Landscaped area.	Below the carpark.

SOIL PFAS INVESTIGATION - 172678

Sample	Current Location	Location on Proposed Redevelopment
BH6	Historical AEC 1, vegetated area.	Below the carpark.
BH7	Historical PHAS Concentrations	Below the carpark.
BH8	Central portion of site, observed cracked bitumen surface.	Playground.
BH9	Central portion of site, observed cracked bitumen surface.	Below the childcare facility.
BH10	Southern boundary, Below Historical AEC2	Playground.

7 METHODS

The methods used for the collection of data for this investigation are presented in the following sections.

7.1 Soil Logging

Soil logging was conducted by Arcadis with soil borehole locations advanced using a 300mm solid flight auger mounted on a backhoe. Ten (10) soil bores were advanced across the site.

Samples were collected at regular intervals, changes in geology and in zones of potential impact. Soil samples were collected directly from the solid flight auger by hand, using new disposable nitrile gloves.

Auger samples were taken from the central area of the auger to avoid contact with the auger surface or surrounding matrix to prevent cross contamination.

Each soil sample was placed directly into a laboratory supplied 250ml PFAS specific sample container (high density polyethylene or polypropylene) with the details of the sample, including the sample name, the job number, the date of sampling and the sample depth. Sample preservation was performed in accordance with ASC NEPM 2013 with samples immediately placed and stored in an ice filled Esky to keep them chilled, prior to being couriered to the laboratory with the signed chain of custody form filled out with the required analysis.

Detailed borelogs are provided in **Appendix B**.

7.2 Laboratory Analysis and Methods

A brief outline, identifying the differing analytical methods used is provided below.

Table 7-1 Laboratory Methods

Sample locations	Laboratory and Method
AECOM 2015B **SV01, SV02, and SV03.**	ALS - PFAS In-House. A portion of soil is soaked in sodium hydroxide followed by extraction with methanol. The extract is neutralised with hydrogen chloride and an aliquot taken to dryness, made up in mobile phase. Analysis is by Liquid chromatography–mass spectrometry (LC-MS), MS, electrospray ionization (ESI) Negative Mode using multiple reaction monitoring (MRM).
Arcadis 2017 **QA2.**	ALS - TOP Assay PFAS In-House Extraction followed by digestion with oxidation per Houtz, Erika F.; Sedlak, David L. (2012): Oxidative Conversion as a Means of Detecting Precursors to Perfluoroalkyl Acids in Urban Runoff. In Environmental Science & Technology 46 (17), pp. 9342¿9349: A soil extract is taken to near dryness and made up to 5 mL with reagents. The sample is digested with persulfate under alkaline conditions, neutralised and prepared for analysis per EP231 A portion of the oxidised sample is mixed with methanol (1:1) prior to analysis by LC-Electrospray-MS-MS, Negative Mode using MRM. Where commercially available, isotopically labelled analogues of the target analytes are used as internal standards for quantification. Where a labelled analogue is not commercially available, the internal standard with similar chemistry and the closest retention time to the target is used for quantification. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers.
Arcadis 2017	SGS - Standard PFAS This method is intended for the analysis of polyfluorinated compounds (PFCs) by High Performance Liquid Chromatography-Tandem Mass

Sample locations	Laboratory and Method
BH1 though to BH10 and QA1.	Spectrometry (HPLC-MS/MS). A weighed soil sample is solvent extracted with acetonitrile/methanol then filtered into a 1mL polypropylene for analysis by LC-MS/MS.
Arcadis 2017 **BH1, BH3, BH6, BH7, and BH10.**	SGS - TOP Assay PFAS This method is intended for the analysis of polyfluorinated compounds (PFCs) by High Performance Liquid Chromatography-Tandem Mass Spectrometry (HPLC-MS/MS). Soil and sediment samples undergo oxidative pre-treatment (TOPs) prior to concentration using Solid Phase Extraction (SPE) and the SPE cartridge is eluted with 4ml of 0.1% acetic acid/ACN and then 4ml of ACN. The eluent is then concentrated and transferred to a 1mL polypropylene GC vial for analysis by LC-MS/MS.

Arcadis notes that the method utilised between the 2015 and 2017 have differed and that comparison between the two (2) sets of data is not recommended. Furthermore, the comparison between both the primary laboratory (SGS) and secondary laboratory (ALS) is suitable for the intended purpose of this investigation.

Laboratory analytical methods and analyte LORs are shown in the analytical certificates provided in **Appendix C**.

8 ASSESSMENT CRITERIA

8.1 Rationale for Selection Soil Assessment Criteria

The soil assessment criteria selected for this investigation have been adopted from the PFAS NEPM, Consultation Draft (August 2017) which were developed by the NSW OEH and NSW Health. Soil concentrations of PFAS were assessed against the low density residential screening level, which is based on:

- 20% of Food Standards Australia and New Zealand's Tolerable Daily Intake, i.e. up to 80% of exposure is assumed to come from other pathways.
- ASC NEMP (2013) HIL-A assumptions with home grown produce included (10%).

The HIL- A values provide a conservative preliminary assessment of potential risks at sites where children are likely to be the most sensitive human receptors, including childcare centres, kindergartens, preschools and primary schools and their integral playgrounds.

The source document detailing the OEH assumptions for the derivation of the PFOS soil criteria has not been made publicly available at this time. The assumptions included for parameters such as dermal absorption, bioaccumulation, or intake from fruit and vegetables therefore cannot be reviewed and assessed for their appropriateness for use at a child care centre. Given that the derived HIL-A for PFOS (**0.009 mg/kg**) is approximately 4 orders of magnitude below the HIL-B for PFOS derived by OEH (2 mg/kg), it is likely that the fruit and vegetable ingestion pathway is a key driver for the low HIL-A value.

Given that the home grown produce pathway would not be relevant for this site, a reality check of the OEH number has been performed, using the HILs calculator provided online in the NEPM toolbox (http://www.nepc.gov.au/nepms/assessment-site-contamination/toolbox). Using the current Australian tolerable daily intake for PFOS/PFHxS (FSANZ, 2017) with the plant uptake pathway removed from the calculation, an HIL-A for PFOS/PFHxS of **1 mg/kg** was derived (see **Appendix E**).

As the OEH values represent the most current screening criteria published for PFAS in soils in Australia, these guidelines were adopted for a conservative screening approach. Secondary consideration of the derived HIL-A with no home grown produce exposures incorporated (calculated to 1 mg/kg, see **Appendix E**) has also been incorporated into this assessment.

The selection of the residential value for assessment of PFAS is based on the:

- Intended use of the site – Childcare facility.
- Potential receptor/s onsite – Children and Workers.
- Exposure that may be experienced – Current design of childcare facility has access to soils.

Soil analytical results and guideline criteria are tabled in **Appendix D**.

9 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

9.1 Field Quality Assurance

9.1.1 Details of Sampling Team

Soil sampling was conducted by Arcadis personnel Ryan Stewart who are trained and experienced in the supervision and in the collection of environmental samples.

9.1.2 Decontamination Procedures Carried out Between Sampling Events

Only solid flight augers were reused during the sampling events at the site.

Where solid flight augers, were used it is noted that they were brushed down between sampling locations as the nature of the soils encountered were dry and came loose freely.

Arcadis consider this to have been a suitable method of decontamination.

9.1.3 Chain of Custody Details

Soil samples were transported to the laboratory under a chain of custody (COC). Information on the COC included the sampler, sample identifier, sample matrix, collection date, analyses to be performed, sample preservation method, sample release date and sample received date. COCs are provided in **Appendix C** along with the laboratory reports.

9.1.4 Sampling Splitting Techniques

Soil duplicate sample were collected by taking representative samples of the soil at the same depth interval.

9.1.5 Statement of Duplicate Frequency

Table 9-1 Field QAQC Analytical Quantities

Media	Primary	Duplicate	Triplicate	Rate
Soil	10	1	1	1:10

A single sets of field duplicates for soil were collected during the fieldworks. A QA/QC sampling rate of 1:10 for soil was therefore achieved. The QA/QC sampling ratio for soil is in accordance with the Australian Standard 4482.1-2005 'Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds' which is a ratio of 1:20.

The following soil QA/QC samples were collected:

- QA1 and QA2 were respectively soil intra-laboratory and inter-laboratory duplicates of sample BH7 0.0-0.2.

9.2 Laboratory QA/QC

9.2.1 Holding Times

All holding times were reported as being within specified ranges.

9.2.2 Laboratory Accreditation and Analytical Methods Used

The primary laboratory used for soil samples was SGS Australia Pty Ltd (SGS), while the secondary laboratory was ALS Environmental (ALS).

Both SGS and ALS are accredited by NATA to ISO 17025, accreditation number 2562 (SGS), and 825 (ALS).

Laboratory QA/QC is provided on the laboratory reports in **Appendix B**.

9.2.3 Percent Recoveries of Spikes and Duplicates

9.2.3.1 Laboratory Duplicate RPD

No laboratory duplicate RPD exceedances existed for soil samples.

9.2.3.2 Matrix spikes recoveries

Where reported no matrix spikes recoveries exceedances exist for soil samples.

9.2.4 Standard solution results

All standard solution (or LCS – laboratory control sample) were within acceptable range.

9.2.5 Laboratory duplicate results

All laboratory duplicates were within acceptable ranges.

9.2.6 Laboratory blank results

No laboratory blank exceedances existed for both soil samples.

9.2.7 PFAS Oxidation – Primary Samples

Table 9-2 PFAS oxidation %

Sample	BH1	BH2	BH3	BH4	BH5	BH6	BH7	BH8	BH9	BH10
Sample Depth range (m)	0.05-0.15	0.0-0.2	0.0-0.1	0.0-0.2	0.0-0.2	0.0-0.2	0.0-0.2	0.02-0.2	0.02-0.2	0.1-0.2
Percent Oxidation	67	NA	80	NA	NA	67	95	NA	NA	98

General comments:

- Samples from BH4 0.0-0.2, BH5 0.0-0.2, and BH10 0.1-0.2 are considered to have undergone an acceptable level of oxidation after review of analytical data.
- Incomplete oxidation is observed for samples at locations BH1 0.05-0.15, BH2 0.0-0.2, BH3 0.0-0.1, BH6 0.0-0.2, BH7 0.0-0.2, and BH10.
- Potential for false positive for Pentafluoropropionic anhydride (PFPA) in samples from the following locations BH1 0.05-0.15, BH2 0.0-0.2, BH7, BH8 0.02-0.2, BH9 0.02-0.2, and BH3 0.0-0.1.
- Perfluorooctane sulfonamide (FOSA) and perfluoroalkyl sulfonamidoethanol (FOSE) should convert to PFOS/PFOA in sample BH7 0.0-0.2.
- FOSA should convert to PFOS/PFOA in sample BH10 0.1-0.2.

The primary laboratory SGS was contacted regarding the above comments, and has confirmed their analytical concentrations.

Given the sensitive nature of the proposed redevelopment of the site, all analytical results were considered relevant for the assessment of child care exposures.

9.3 QA/QC Data Evaluation

9.3.1 Evaluation of the QA/QC Information Compared to the DQOs

Documentation completeness:

- Borehole logs and COC forms were completed and appropriate.

Data completeness:

- All samples were received by the laboratories and analytical results reported including laboratory QA/QC.

Data comparability:

- Arcadis standard operating procedures, Australian Standards, (AS4482.1 2005 and AS4482 2-1999) and industry best practice were followed during soil sampling.
- Consistent field conditions and staff were used during sampling.
- Standard analytical methods were used by the laboratories for all analyses.
- The limits of reporting are appropriate though differing between both laboratories.
- The limits of reporting provided by the primary laboratory are noted to be above that of the selected analytical guideline. This is not considered to be an issue as the majority or samples have exceeded the conservative guidelines.

Data representativeness:

- The holding times were acceptable.
- The frequency of laboratory blanks was acceptable.

Precision:

- Field duplicate pairs for soil were collected at a rate within the 1:10.

9.3.2 Data Comparability

- All soil samples were collected using the same method. The weather conditions remained suitable for the duration of the sampling.

- Though the analytical limits of reporting between laboratories differed they are both considered acceptable.

9.4 Relative Percentage Difference

Precision of analytical techniques is measured by the relative percent difference (RPD) between duplicate and triplicate results. Acceptance targets for field duplicates (intra-laboratory and inter-laboratory samples) are dependent on matrix type, analyte type and analyte concentrations and are as follows:

The criteria for the RPD of organics is as follows:

- RPD criteria of 50% or less, for concentrations > or = 10 times EQL;
- RPD criteria of 75% or less, for concentrations between 5 and 10 times the EQL; and
- RPD criteria of 100% or less, for concentrations < 5 times EQL.

Replicate data for field duplicates for inorganics, including metals is expected to be as follows:

- RPD criteria of 30% or less, for concentrations > or = 10 times EQL;
- RPD criteria of 75% or less, for concentrations between 5 and 10 times the EQL; and
- RPD criteria of 100% or less, for concentrations < 5 times EQL.

It is noted that RPDs were generally only calculated for groups of compounds with detections above the laboratory detection limits.

RPDs were all reported within acceptable ranges for all analytes

Results of RPD calculations are presented in **Appendix D**.

10 OBSERVATIONS AND ANALYTICAL RESULTS

The following section presents an overview of the field observations encountered during the site works as well as historical assessments.

10.1 Field Observations

10.1.1 Soil

The soil types encountered at the site were generally consistent with historical investigations as well as between sample locations. The soils identified during intrusive works by Arcadis include:

- Fill material encountered at each sample location, with the exception of BH2, BH4 and BH7, varied from surface to 0.6m bgl in depth. Fill material was described as:
  - Road base, gravelly clay, silty gravel, clayey gravelly silt. At all locations, the fill material was dry.
- Natural soils at the site were described as:
  - Silty Sandy Clay, and Silty clays with trace sands. Natural soils ranged from red to brown with grey and red mottling. The soils were cohesive, roots were observed, ranged from humid to dry, and were stiff.
- Bedrock was not encountered by at any of the sample locations advanced by Arcadis.

No hydrocarbon/chemical/sweet odours were identified by Arcadis during the investigation.

10.2 Soil Analytical Results

The following presents a summary of current in-situ soil and COPC analytical concentrations for PFAS. Analytical summary tables are included in **Appendix D** with copies of laboratory certificates included in **Appendix C**.

10.2.1 PFAS

Concentrations of PFAS were identified within all samples collected and analysed at the site. Concentrations of PFOS and PFHxS (sum) exceeded the OEH derived residential screening guideline (0.009 mg/kg) for the following samples:

- BH1 0.05-0.15 at 0.02 mg/kg
- BH3 0.0-0.1 at 0.06 mg/kg
- BH6 0.0-0.2 at 0.04 mg/kg
- BH7 0.0-0.2 at 0.74 mg/kg
- QA1 (intra-lab duplicate for BH7 0.0-0.2) at 0.34 mg/kg
- QA2 (inter-lab triplicate for BH7 0.0-0.2) at 0.326 mg/kg
- BH10 0.1-0.2 at 0.9 mg/kg

Arcadis notes that no samples exceeded the residential screening guidelines for PFOS and PFHxS (sum), with the home grown produce pathway removed (1mg/kg).

11 PRELIMINARY RISK ASSESSMENT

The preliminary risk assessment focuses on the objectives of this investigation which is to assess the site for PFAS in soil and assess the potential risk PFAS may pose to the proposed childcare centre.

11.1 Summary of Soil Conditions

Several soil samples, as listed within **Section 10.2.1**, from across the site exceeded the adopted screening guidelines for PFOS and PFHxS (sum).

Due to the historical use of the site as a fire station, the likely source of PFAS at the site is from AFFF. AFFF is known to have been stored at the site in 20L drums in the internal store room (off the engine bay). The AFFF was used to top up the foam tanks of fire engines as required. Due to the presence of PFAS across the site it is possible that the fire engines foam tanks were filled at various location across the site resulting in spills.

As the concentrations of PFAS identified were consistent across the site and relatively low in nature, Arcadis has not identified a specific location which would have been used for disposal of AFFF to ground on site.

11.2 Assessment of Potential Transport Mechanisms

Transport mechanisms are the manner in which contaminants migrate away from the source area. The transport mechanisms considered for the site are as follows:

Soil:

- The source for PFAS at the site is considered to be AFFF use, particularly associated with refilling foam tanks on fire engines and general storage of foams.

Surface Water:

- PFAS is soluble in water and could have potentially spread across the site during rain events, causing overland flow.

Air:

- Use of AFFF may result in airborne dispersal as aerosols.

Bioaccumulation:

- While PFAS may bioaccumulate from soils into fruit, vegetables, poultry etc, this pathway is unlikely to be realised at this site.

11.3 Assessment of Possible Exposure Routes and Receptors

The primary exposure route to PFAS by receptors on site (children and workers at the childcare centre) is incidental ingestion of soil.

Dermal absorption is expected to be minimal due to the physico-chemical properties of PFAS, and exposure via bioaccumulation pathways (ingestion of impacted fruit, vegetables, poultry, etc) are unlikely at a child care centre.

Based on the current development plan for the childcare centre, ingestion is considered to be a potentially complete pathway.

11.4 Conceptual Site Model

Based on the site history, site observations, intrusive works, and proposed development the following conceptual site model has been developed. Arcadis notes that AEC 3 is the primary focus of the Conceptual Site Model.

11.4.1 Potential Receptors, Exposures, and Pathways

The following provides an overview of the potential exposure pathways. For an exposure pathway to be considered complete, there must be a:

- Source of the contaminant, that is, how the contaminant is introduced into the environment.
- The method for the contaminant to move through the environment (e.g. soil).
- An exposure point, that is, how people come into contact with the chemicals (e.g. eating soil).
- An exposure route, that is, how can the chemical enter the body (e.g. ingestion).

If any of these steps (source, transport media, exposure point, or route) is not present, then the exposure pathway is incomplete and hence further assessment of risks is not required. In cases where the exposure pathways are complete, or have the potential to be complete, then the pathways can be considered either significant or insignificant. The significance of the exposure pathway depends on the nature of the contamination present and the evaluation of the likely exposure concentrations that may be associated with the pathway.

In identifying the complete and significant exposure pathways the following is noted:

- Concentrations of PFOS and PFHxS (sum) were identified across the site within surface soils, above the OEH residential screening criteria.
- The proposed building development plan currently has a playground which would allow children direct access to soils.

Based on the proposed development of the site into a child care facility and review of the elements identified in the above sections, the following exposure pathway assessment is provided to determine the means by which receptor populations may potentially be exposed to the identified impacts in surface soil at the site.

Table 11-1 Potential Soil Exposure Pathway Assessment Based on Proposed Development

Pathway	Onsite Soil
Direct Contact Ingestion	**Potentially Complete** Concentrations of COPCs in surface soils, which children may be exposed to have exceeded the residential screening criteria published by OEH. Concentrations of COPCs in surface soils were *below* the derived residential screening criteria, which assumed that home grown produce pathways were incomplete (see **Appendix E**).

11.5 Proposed Mitigation Measures

Based on the above information Arcadis believes that the site can be made suitable for the proposed childcare facility subject to incorporation of the following permanent mitigation measures.

To remove the potential for exposure via bioaccumulation pathways, such that the derived screening value of 1 mg/kg may be applied, home grown produce such as herbs, fruits, vegetables, etc should not be grown at the site within the impacted site soils.

In addition, it is proposed that a barrier is constructed to limit potential for direct contact with shallow soils by site occupants, particularly children that are likely to come in contact with these soils (e.g. playground soils and landscaped areas). Refer to **Appendix A, Figure 4** for a figure highlighting areas proposed to have mitigation implemented.

Potential barriers include:

- Concrete pavement.
- Compacted decomposed Gravel (minimum 100mm) over geofabric.
- Synthetic turf.

- Rubber soft fall.
- Soft fall mulch (minimum 150mm) over geofabric.
- Tiles and pavers.
- Wooden decking.
- Play sand/digging pit (minimum of 400mm in depth) – Arcadis notes that a geofabric liner will be required below these areas to prevent direct contact to the underlying soils.

Any produce (e.g. fruit or vegetables) grown for consumption must be contained within elevated (400 mm) planter boxes with imported growing medium and must be placed on top of a base layer of geofabric material.

Several mature trees and general landscaping will be located within the playgrounds of the proposed redevelopment. To comply with tree protection guidelines as well as provide a satisfactory barrier, either compacted decomposed gravel, soft fall mulch, and/or wooden decking as detailed above will be used around the base of these trees.

Arcadis assumes that no additional mitigation measures will be required for the footprint of the childcare facilities building, or the proposed carpark. This is because it is expected that these areas will be sealed with appropriate building products resulting in no exposure pathway to subsequent site soils.

Based on the implementation of the above mitigation measures, the potentially complete exposure pathway is revised to incomplete and therefore, the site would be suitable for the proposed childcare facility.

12 CONCLUSIONS AND RECOMMENDATIONS

12.1 Conclusions

The site is located on Block 22 Section 97 Charnwood and it is understood that the site is intended to be redeveloped into a childcare facility.

A historical environmental investigation identified concentrations of PFAS within natural soils in the southern portion of the site. Due to the historical identification of PFAS at the site the ACT Health Directorate required additional assessment of the site and mitigation measures, focusing on areas in which children are likely to come in contact with site soils (inclusive of playgrounds and landscaped areas).

The objective of this investigation was to assess the soil at the site for PFAS and assess the potential risk of PFAS to the proposed childcare centre.

Ten (10) boreholes were advanced across the site in order to assess soils for potential PFAS impacts.

Concentrations of PFOS and PFHxS (sum) exceeded the OEH residential HSL screening guidelines (0.009 mg/kg) for the following samples:

- BH1 0.05-0.15 at 0.02 mg/kg.
- BH3 0.0-0.1 at 0.06 mg/kg.
- BH6 0.0-0.2 at 0.04 mg/kg.
- BH7 0.0-0.2 at 0.74 mg/kg.
- QA1 (intra-lab duplicate for BH7 0.0-0.2) at 0.34 mg/kg.
- QA2 (inter-lab triplicate for BH7 0.0-0.2) at 0.326 mg/kg.
- BH10 0.1-0.2 at 0.9 mg/kg.

All locations were below the derived screening level of 1 mg/kg, assuming that home grown produce pathways are removed.

A preliminary risk assessment was performed and identified that with the proposed redevelopment plan, the soil ingestion exposure pathway for children is potentially complete.

Arcadis believes that the implementation of a barrier between the existing soil and occupants of the childcare centre will make the exposure pathway incomplete. The following permanent barriers will be acceptable for use to prevent exposure to soil on the site:

- Concrete pavement.
- Compacted decomposed Gravel (minimum 100mm) over geofabric.
- Synthetic turf.
- Rubber soft fall.
- Soft fall mulch (minimum 150mm) over geofabric.
- Tiles and pavers.
- Wooden decking.
- Play sand/digging pit (minimum of 400mm in depth) – Arcadis notes that a geofabric liner will be required below these areas to prevent direct contact to the underlying soils.

Any produce (e.g. fruit or vegetables) grown for consumption must be contained within elevated (400 mm) planter boxes with imported growing medium and must be placed on top of a base layer of geofabric material.

Several mature trees and general landscaping will be located within the playgrounds of the proposed redevelopment. To comply with tree protection guidelines as well as provide a

satisfactory barrier, either compacted decomposed gravel, soft fall mulch, and/or wooden decking as detailed above will be used around the base of these trees.

12.2 Recommendations

Based on the results of this investigation, Arcadis makes the following recommendations:

- Implement mitigation measures as described above.
- Where surface soil needs to be moved for construction purposes it should be placed under sealed hardstand areas such as the proposed carpark and or building, where possible.
- A confirmatory site inspection and review of the mitigation measure once installed should be completed. This will include a brief letter report to be provided to the ACT Health Directorate.
- No soil is to be removed from site without prior approval from the ACT EPA.
- An Environmental Management Plan (EMP) focusing on maintenance of the proposed mitigation measures and or intrusive works at the site should be prepared for the site.

Based on the implementation of the above mitigation measures, the potentially complete exposure pathway is revised to incomplete and therefore, the site would be suitable for the proposed childcare facility.

13 REFERENCES

ACT EPA (November 2009) Contaminated Sites Environmental Protection Policy;

Australian Government Department of Health (2017) Health Based Guidance Values for PFAS, for use in site investigations in Australia;

Environment and Energy (August 2017) PFAS National Environmental Management Plan, Consolation Draft;

Heads of EPAs Australia and New Zealand and Australian Government Department of the National Environment Protection Council (1999) National Environment Protection Measure (NEPM) 1999 as amended 2013– Assessment of Site Contamination Schedule B (1) and B (2);

National Environment Protection Council (1999) National Environment Protection Measure (NEPM) 1999 as amended 2013- ASC NEPM Toolbox – HILs Calculator - http://www.nepc.gov.au/nepms/assessment-site-contamination/toolbox;

NSW Office of Environment and Heritage (2011) 'Guidelines for Consultants Reporting on Contaminated Sites';

APPENDIX A

Site Figures

Key:

Block 22 Section 99 Charnwood (Site)

North

Source: Google Earth 2017

Scale (m)

0 50

Site location:

Block 22 Section 97 Charnwood

Figure 1:

Site Location

Job:

17267 PFAS Soil Assessment

ARCADIS

Key:

Sample Location (AECOM 2015B)

Block 22 Section 99 Charnwood (Site)

Source: Google Earth 2017

AECOM (2015A) AECs

AEC 1 - Former USTs
AEC 2 - Car Wrecks/Training
AEC 3 - AFFF Storage
AEC 4 - Potential Uncontrolled Fill
AEC 5 - Septic Tanks and drainage

North

Scale (m) 0 10

Site location: Block 22 Section 97 Charnwood

Figure 2: Site Layout

Job: 17267 - PFAS Soil Assessment

ARCADIS

Key:

Sample Location (Arcadis 2017)

Block 22 Section 99 Charnwood (Site)

Source: Google Earth 2017

North

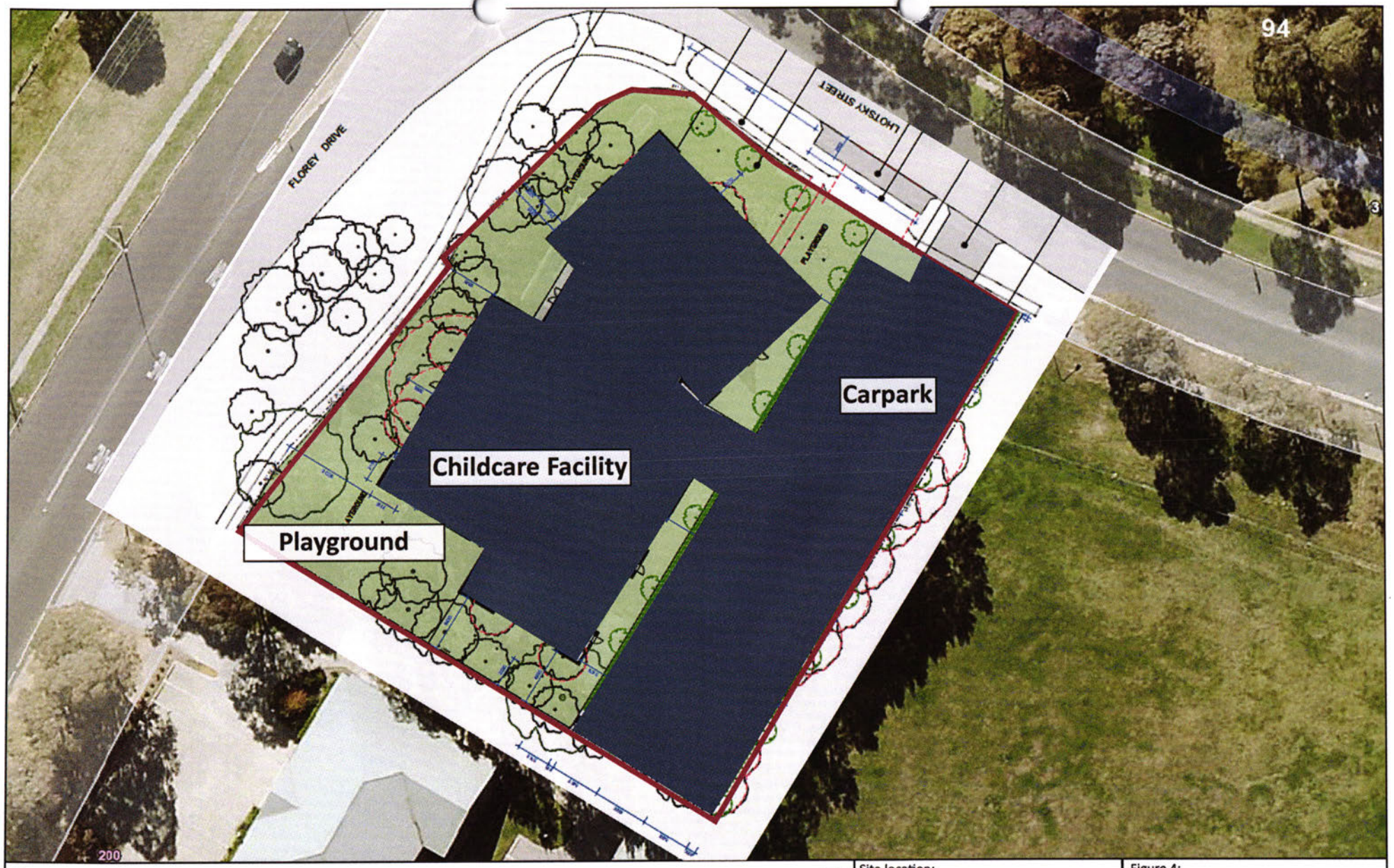
Scale (m) 0 10

Site location: Block 22 Section 97 Charnwood

Figure 3: Arcadis Soil Sample Locations

Job: 17267 PFAS Soil Assessment

ARCADIS



Key:

Area of Site Requiriung Mitigation - Playground and Landscaped Areas

Childcare Facility and Carpark - Area Not Requiring Mitigation

Source: Google Earth 2017

North

Scale (m)

0 10

Site location:
Block 22 Section 97 Charnwood

Figure 4:
Proposed Childcare Facility and Mitigation Barrier Locations

Job:
17267 - PFAS Soil Assessment

ARCADIS

APPENDIX B

Borehole Logs.

Borehole Log

Environmental Strategies | ARCADIS Design & Consultancy for natural and built assets

Hole ID.	**BH1**
Project Number:	**17267**
Hole Depth:	**1.50 m**
Sheet:	**1 of 1**

Project Name:	**Perfluorooctane Sulfonic Acid (PFOS) Assessment**
Location / Site:	**West Belconnen Fire Station, Block 22, Section 97, Charnwood ACT**
Client:	**Peach&Co**
Drilling Company:	**-**
Drill Method:	**Solid Flight Auger**

Date:	**22/09/2017**
Ground Level :	**N/A**
Top of Casing :	**N/A**
Easting:	**N/A**
Northing:	**N/A**
Zone:	**N/A**

Method	Water Level	Depth (mbgl)	RL (mAHD)	Graphic Log	USCS Symbol	Material Type	Material Description	Moisture	Sample ID	Observations / Comments
									ID No.	
SFA		0.05				Fill	**BITUMEN.**			
		0.15					**FILL** - ROADBASE, grey / green, large gravels and sand.		BH1_0.05-0.15	No odour. No staining. No PACM observed.
		0.2			CL		**Silty Sandy CLAY** - red.	humid		No odour. No staining.
		0.4							BH1_0.4-0.6	
		0.6								
		0.70				Natural				
		0.8			CL		**Silty CLAY, trace Sand** - brown, some grey and red mottling, cohesive, some roots observed.	humid	BH1_0.9-1.1	No odour. No staining.
		1.0								
		1.2								
		1.4								
		1.50					**End of Hole at 1.50 m** Target depth.			
		1.6								
		1.8								
		2.0								

Additional Comments

Strike Groundwater Level

Static Groundwater Level

Method

HA	Hand Auger	MR	Mud Rotary
CC	Concrete Corer	PT	Push Tube
CB	Concrete Breaker	AH	Air Hammer
SFA	Solid Flight Auger	EX	Excavator
HFA	Hollow Flight Auger		
SPT	Standard Penetometer Test		

REUMAD

Log Drawn By: [redacted] Contact: [redacted]

Logged By: [redacted] Date: 22/09/2017

Checked By: Date:

[DRAWN BY: WWW.REUMAD.COM.AU] ES ARCADIS 17267 CHARNWOOD.GPJ ES.GDT 3/10/17 10:36:57 AM

Borehole Log

Environmental Strategies | ARCADIS Design & Consultancy for natural and built assets

Hole ID.	BH2
Project Number:	17267
Hole Depth:	1.10 m
Sheet:	1 of 1

Project Name:	Perfluorooctane Sulfonic Acid (PFOS) Assessment	Date:	22/09/2017
Location / Site:	West Belconnen Fire Station, Block 22, Section 97, Charnwood ACT	Ground Level :	N/A
Client:	Peach&Co	Top of Casing :	N/A
Drilling Company:	-	Easting:	N/A
Drill Method:	Solid Flight Auger	Northing:	N/A
		Zone:	N/A

Method	Water Level	Depth (mbgl)	RL (mAHD)	Graphic Log	USCS Symbol	Material Type	Material Description	Moisture	Sample ID / ID No.	Observations / Comments
SFA		0.2 0.4 0.6 0.80			ML	Natural	**SILT, some Gravel, trace Clay** - pale brown, rounded gravel, roots.	dry	BH2_0.0-0.2 BH2_0.4-0.6	No odour. No staining. No PACM observed.
		1.0 1.10			CL		**Silty CLAY, trace Sand** - grey and red, stiff.	dry	BH2_0.9-1.1	No odour. No staining.
		1.2 1.4 1.6 1.8 2.0					**End of Hole at 1.10 m** Target depth.			

Additional Comments

Strike Groundwater Level

Static Groundwater Level

Method

HA	Hand Auger	MR	Mud Rotary
CC	Concrete Corer	PT	Push Tube
CB	Concrete Breaker	AH	Air Hammer
SFA	Solid Flight Auger	EX	Excavator
HFA	Hollow Flight Auger		
SPT	Standard Penetometer Test		

REUMAD

Log Drawn By: [redacted]
Contact: [redacted]@reumad.com.au

Logged By: [redacted]
Checked By:

Date: 22/09/2017
Date:

[DRAWN BY: WWW.REUMAD.COM.AU] ES ARCADIS 17267 CHARNWOOD.GPJ ES.GDT 3/10/17 10:36:58 AM

Borehole Log

Environmental Strategies | ARCADIS Design & Consultancy for natural and built assets

Hole ID.	BH3
Project Number:	17267
Hole Depth:	1.10 m
Sheet:	1 of 1

Project Name:	Perfluorooctane Sulfonic Acid (PFOS) Assessment
Location / Site:	West Belconnen Fire Station, Block 22, Section 97, Charnwood ACT
Client:	Peach&Co
Drilling Company:	-
Drill Method:	Solid Flight Auger

Date:	22/09/2017
Ground Level :	N/A
Top of Casing :	N/A
Easting:	N/A
Northing:	N/A
Zone:	N/A

Method	Water Level	Depth (mbgl)	RL (mAHD)	Graphic Log	USCS Symbol	Material Type	Material Description	Moisture	Sample ID / ID No.	Observations / Comments
SFA		0.10				Fill	**FILL** - SILT with Gravel, brown, roots, organics.	dry	BH3_0.0-0.1	No odour. No staining. No PACM observed.
		0.2			ML		**SILT** - pale brown, cohesive, roots.	humid		No odour. No staining.
		0.30					**CLAY, trace Sand** - grey and red, stiff, roots.	dry	BH3_0.4-0.6	No odour. No staining.
		0.4								
		0.6			CL	Natural				
		0.8							BH3_0.9-1.1	
		1.0								
		1.10					**End of Hole at 1.10 m** Target depth.			
		1.2								
		1.4								
		1.6								
		1.8								
		2.0								

Additional Comments

Strike Groundwater Level

Static Groundwater Level

Method

HA	Hand Auger	MR	Mud Rotary
CC	Concrete Corer	PT	Push Tube
CB	Concrete Breaker	AH	Air Hammer
SFA	Solid Flight Auger	EX	Excavator
HFA	Hollow Flight Auger		
SPT	Standard Penetometer Test		

REUMAD

Log Drawn By: [redacted]
Contact: [redacted]@reumad.com.au

Logged By: [redacted]
Checked By:

Date: 22/09/2017
Date:

[DRAWN BY: WWW.REUMAD.COM.AU] ES ARCADIS 17267 CHARNWOOD.GPJ ES.GDT 3/10/17 10:36:59 AM

Borehole Log

Environmental Strategies | ARCADIS Design & Consultancy for natural and built assets

Hole ID.	**BH4**
Project Number:	**17267**
Hole Depth:	**1.10 m**
Sheet:	**1 of 1**

Project Name:	**Perfluorooctane Sulfonic Acid (PFOS) Assessment**
Location / Site:	**West Belconnen Fire Station, Block 22, Section 97, Charnwood ACT**
Client:	**Peach&Co**
Drilling Company:	**-**
Drill Method:	**Solid Flight Auger**

Date:	**22/09/2017**
Ground Level :	**N/A**
Top of Casing :	**N/A**
Easting:	**N/A**
Northing:	**N/A**
Zone:	**N/A**

Method	Water Level	Depth (mbgl)	RL (mAHD)	Graphic Log	USCS Symbol	Material Type	Material Description	Moisture	Sample ID / ID No.	Observations / Comments
SFA		0.2			ML	Natural	**SILT** - pale brown, roots.	dry	BH4_0.0-0.2	No odour. No staining. No PACM observed.
		0.30								
		0.4			CL		**Silty CLAY, trace Sand** - brown, some red and grey mottling, stiff.	humid	BH4_0.4-0.6	No odour. No staining.
		0.6								
		0.8					- becomes more pale with depth, increased clay content.			
		1.0								
		1.10					**End of Hole at 1.10 m** Target depth.			
		1.2								
		1.4								
		1.6								
		1.8								
		2.0								

Additional Comments

Strike Groundwater Level

Static Groundwater Level

Method

HA	Hand Auger	MR	Mud Rotary
CC	Concrete Corer	PT	Push Tube
CB	Concrete Breaker	AH	Air Hammer
SFA	Solid Flight Auger	EX	Excavator
HFA	Hollow Flight Auger		
SPT	Standard Penetometer Test		

REUMAD

Log Drawn By: [redacted]
Contact: [redacted]@reumad.com.au

Logged By: [redacted]
Checked By:

Date: 22/09/2017
Date:

[DRAWN BY: WWW.REUMAD.COM.AU] ES.ARCADIS 17267 CHARNWOOD.GPJ ES.GDT 3/10/17 10:37:00 AM

Borehole Log

Environmental Strategies | ARCADIS Design & Consultancy for natural and built assets

Hole ID.	BH5
Project Number:	17267
Hole Depth:	1.10 m
Sheet:	1 of 1

Project Name:	Perfluorooctane Sulfonic Acid (PFOS) Assessment
Location / Site:	West Belconnen Fire Station, Block 22, Section 97, Charnwood ACT
Client:	Peach&Co
Drilling Company:	-
Drill Method:	Solid Flight Auger

Date:	22/09/2017
Ground Level :	N/A
Top of Casing :	N/A
Easting:	N/A
Northing:	N/A
Zone:	N/A

Method	Water Level	Depth (mbgl)	RL (mAHD)	Graphic Log	USCS Symbol	Material Type	Material Description	Moisture	Sample ID / ID No.	Observations / Comments
SFA		0.2 0.4 0.60				Fill	**FILL** - Clayey Gravelly SILT, pale brown, roots.	dry	BH5_0.0-0.2 BH5_0.4-0.6	No odour. No staining. No PACM observed.
		0.8 1.0 1.10			CL	Natural	**Silty CLAY, trace Sand** - brown, some red and grey, roots. - becomes pale with depth.	dry		No odour. No staining.
		1.2 1.4 1.6 1.8 2.0					**End of Hole at 1.10 m** Target depth.			

Additional Comments

Strike Groundwater Level

Static Groundwater Level

Method

HA	Hand Auger	MR	Mud Rotary
CC	Concrete Corer	PT	Push Tube
CB	Concrete Breaker	AH	Air Hammer
SFA	Solid Flight Auger	EX	Excavator
HFA	Hollow Flight Auger		
SPT	Standard Penetometer Test		

REUMAD

Log Drawn By: [redacted]
Contact: [redacted]@reumad.com.au

Logged By: [redacted]
Checked By:

Date: 22/09/2017
Date:

[DRAWN BY: WWW.REUMAD.COM.AU] ES ARCADIS 17267 CHARNWOOD.GPJ ES.GDT 3/10/17 10:37:01 AM

Borehole Log

Environmental Strategies | ARCADIS Design & Consultancy for natural and built assets

Hole ID.	BH6
Project Number:	17267
Hole Depth:	1.10 m
Sheet:	1 of 1

Project Name:	Perfluorooctane Sulfonic Acid (PFOS) Assessment	Date:	22/09/2017
Location / Site:	West Belconnen Fire Station, Block 22, Section 97, Charnwood ACT	Ground Level :	N/A
Client:	Peach&Co	Top of Casing :	N/A
Drilling Company:	-	Easting:	N/A
Drill Method:	Solid Flight Auger	Northing:	N/A
		Zone:	N/A

Method	Water Level	Depth (mbgl)	RL (mAHD)	Graphic Log	USCS Symbol	Material Type	Material Description	Moisture	Sample ID / ID No.	Observations / Comments
SFA		0.2 0.30				Fill	**FILL** - Silty GRAVEL, brown, large gravel.	dry	BH6_0.0-0.2	No odour. No staining. No PACM observed.
		0.4 0.6 0.8 1.0 1.10			CL	Natural	**Silty CLAY, trace Sand** - brown, becoming stiffer with depth. - pale brown from 0.8m.	dry	BH6_0.4-0.6	No odour. No staining.
		1.2 1.4 1.6 1.8 2.0					**End of Hole at 1.10 m** Target depth.			

Additional Comments

Strike Groundwater Level

Static Groundwater Level

Method

HA	Hand Auger	MR	Mud Rotary
CC	Concrete Corer	PT	Push Tube
CB	Concrete Breaker	AH	Air Hammer
SFA	Solid Flight Auger	EX	Excavator
HFA	Hollow Flight Auger		
SPT	Standard Penetometer Test		

REUMAD

Log Drawn By: [redacted]
Contact: [redacted]@reumad.com.au

Logged By: [redacted]
Checked By:

Date: 22/09/2017
Date:

[DRAWN BY: WWW.REUMAD.COM.AU] ES.ARCADIS 17267 CHARNWOOD.GPJ ES.GDT 3/10/17 10:37:01 AM

Borehole Log

Environmental Strategies | ARCADIS Design & Consultancy for natural and built assets

Hole ID.	BH7
Project Number:	17267
Hole Depth:	1.00 m
Sheet:	1 of 1

Project Name:	Perfluorooctane Sulfonic Acid (PFOS) Assessment
Location / Site:	West Belconnen Fire Station, Block 22, Section 97, Charnwood ACT
Client:	Peach&Co
Drilling Company:	-
Drill Method:	Solid Flight Auger

Date:	22/09/2017
Ground Level :	N/A
Top of Casing :	N/A
Easting:	N/A
Northing:	N/A
Zone:	N/A

Method	Water Level	Depth (mbgl)	RL (mAHD)	Graphic Log	USCS Symbol	Material Type	Material Description	Moisture	Sample ID		Observations / Comments
									ID No.	DUP TRIP	
SFA		0.2			CL	Natural	**Silty CLAY, trace Sand** - red, some grey, firm.	humid	BH7_0.0-0.2	QA1 QA2	No odour. No staining. No PACM observed.
		0.40			ML		**Clayey SILT, some Sand and Gravel** - non cohesive. - very stiff at depth.	dry	BH7_0.4-0.6		No odour. No staining.
		1.00					**End of Hole at 1.00 m** Refusal (grinding).				
		1.2									
		1.4									
		1.6									
		1.8									
		2.0									

Additional Comments

Strike Groundwater Level

Static Groundwater Level

Method

HA	Hand Auger	MR	Mud Rotary
CC	Concrete Corer	PT	Push Tube
CB	Concrete Breaker	AH	Air Hammer
SFA	Solid Flight Auger	EX	Excavator
HFA	Hollow Flight Auger		
SPT	Standard Penetometer Test		

REUMAD

Log Drawn By: [redacted]
Contact: [redacted]@reumad.com.au

Logged By: [redacted]
Checked By:

Date: 22/09/2017
Date:

[DRAWN BY: WWW.REUMAD.COM.AU] ES ARCADIS 17267 CHARNWOOD.GPJ ES.GDT 3/10/17 10:37:02 AM

Borehole Log

Environmental Strategies | ARCADIS Design & Consultancy for natural and built assets

Hole ID.	**BH8**
Project Number:	**17267**
Hole Depth:	**1.00 m**
Sheet:	**1 of 1**

Project Name:	**Perfluorooctane Sulfonic Acid (PFOS) Assessment**	Date:	**22/09/2017**
Location / Site:	**West Belconnen Fire Station, Block 22, Section 97, Charnwood ACT**	Ground Level :	**N/A**
Client:	**Peach&Co**	Top of Casing :	**N/A**
Drilling Company:	**-**	Easting:	**N/A**
Drill Method:	**Solid Flight Auger**	Northing:	**N/A**
		Zone:	**N/A**

Method	Water Level	Depth (mbgl)	RL (mAHD)	Graphic Log	USCS Symbol	Material Type	Material Description	Moisture	Sample ID / ID No.	Observations / Comments
SFA		0.02				Fill	**BITUMEN.**	dry	BH8_0.02-0.2	No odour. No staining. No PACM observed.
		0.20					**FILL** - ROADBASE, black and grey, with red clay.			
		0.4			CL	Natural	**Silty CLAY, trace Sand** - red and grey, no to low plasticity.	humid	BH8_0.4-0.6	No odour. No staining.
		0.60								
		0.8			CL		**Silty Sandy CLAY with Gravel** - grey, low cohesion, likely bedrock.	humid		No odour. No staining.
		1.00								
		1.2					**End of Hole at 1.00 m** Refusal.			
		1.4								
		1.6								
		1.8								
		2.0								

Additional Comments

Strike Groundwater Level

Static Groundwater Level

Method

HA	Hand Auger	MR	Mud Rotary
CC	Concrete Corer	PT	Push Tube
CB	Concrete Breaker	AH	Air Hammer
SFA	Solid Flight Auger	EX	Excavator
HFA	Hollow Flight Auger		
SPT	Standard Penetometer Test		

REUMAD

Log Drawn By: [redacted]
Contact: [redacted]@reumad.com.au

Logged By: [redacted]
Checked By:

Date: 22/09/2017
Date:

[DRAWN BY: WWW.REUMAD.COM.AU] ES.ARCADIS 17267 CHARNWOOD.GPJ ES.GDT 3/10/17 10:37:03 AM

Borehole Log

Environmental Strategies | ARCADIS Design & Consultancy for natural and built assets

Hole ID.	BH9
Project Number:	17267
Hole Depth:	1.00 m
Sheet:	1 of 1

Project Name:	Perfluorooctane Sulfonic Acid (PFOS) Assessment
Location / Site:	West Belconnen Fire Station, Block 22, Section 97, Charnwood ACT
Client:	Peach&Co
Drilling Company:	-
Drill Method:	Solid Flight Auger

Date:	22/09/2017
Ground Level :	N/A
Top of Casing :	N/A
Easting:	N/A
Northing:	N/A
Zone:	N/A

Method	Water Level	Depth (mbgl)	RL (mAHD)	Graphic Log	USCS Symbol	Material Type	Material Description	Moisture	Sample ID / ID No.	Observations / Comments
SFA		0.02				Fill	**BITUMEN.** **FILL** - ROADBASE and CLAY with Gravel, red clay.	dry	BH9_0.02-0.2	No odour. No staining. No PACM observed.
		0.20			CL	Natural	**Silty CLAY, some Sand** - red and brown, cohesive, medium plasticity.	moist	BH9_0.4-0.6	No odour. No staining.
		0.60			CL		**Silty Sandy CLAY with Gravel** - grey, low cohesion, likely bedrock.	humid		No odour. No staining.
		1.00					**End of Hole at 1.00 m** Refusal.			

Additional Comments

Strike Groundwater Level

Static Groundwater Level

Method

HA	Hand Auger	MR	Mud Rotary
CC	Concrete Corer	PT	Push Tube
CB	Concrete Breaker	AH	Air Hammer
SFA	Solid Flight Auger	EX	Excavator
HFA	Hollow Flight Auger		
SPT	Standard Penetometer Test		

REUMAD

Log Drawn By: [redacted]
Contact: [redacted]@reumad.com.au

Logged By: [redacted]
Checked By:

Date: 22/09/2017
Date:

[DRAWN BY: WWW.REUMAD.COM.AU] ES.ARCADIS 17267 CHARNWOOD.GPJ ES.GDT 3/10/17 10:37:04 AM

Borehole Log

Environmental Strategies | ARCADIS Design & Consultancy for natural and built assets

Hole ID.	**BH10**
Project Number:	**17267**
Hole Depth:	**1.10 m**
Sheet:	**1 of 1**

Project Name:	**Perfluorooctane Sulfonic Acid (PFOS) Assessment**
Location / Site:	**West Belconnen Fire Station, Block 22, Section 97, Charnwood ACT**
Client:	**Peach&Co**
Drilling Company:	**-**
Drill Method:	**Solid Flight Auger**

Date:	**22/09/2017**
Ground Level :	**N/A**
Top of Casing :	**N/A**
Easting:	**N/A**
Northing:	**N/A**
Zone:	**N/A**

Method	Water Level	Depth (mbgl)	RL (mAHD)	Graphic Log	USCS Symbol	Material Type	Material Description	Moisture	Sample ID / ID No.	Observations / Comments
SFA		0.02				Fill	**BITUMEN.**	dry		No odour. No staining.
		0.10					**FILL** - ROADBASE.	dry		No PACM observed.
		0.2			CL	Natural	**Silty CLAY, trace Sand and Gravel** - pale brown.		BH10_0.1-0.2	No odour. No staining.
		0.4								
		0.6								
		0.8								
		1.0					- some low plasticity at depth.		BH10_1.0-1.1	
		1.10					**End of Hole at 1.10 m** Target depth.			
		1.2								
		1.4								
		1.6								
		1.8								
		2.0								

Additional Comments

Strike Groundwater Level

Static Groundwater Level

Method

HA	Hand Auger	MR	Mud Rotary
CC	Concrete Corer	PT	Push Tube
CB	Concrete Breaker	AH	Air Hammer
SFA	Solid Flight Auger	EX	Excavator
HFA	Hollow Flight Auger		
SPT	Standard Penetometer Test		

REUMAD

Log Drawn By: [redacted]
Contact: [redacted]@reumad.com.au

Logged By: [redacted]
Checked By:

Date: 22/09/2017
Date:

[DRAWN BY: WWW.REUMAD.COM.AU] ES ARCADIS 17267 CHARNWOOD.GPJ ES.GDT 3/10/17 10:37:05 AM

APPENDIX C

Analytical Laboratory Reports

SAMPLE RECEIPT ADVICE

ME304337

CLIENT DETAILS

Contact	[redacted]
Client	ARCADIS AUSTRALIA PACIFIC PTY LIMITED
Address	Unit 5, 9 Beaconsfield Street Fyshwick ACT 2609
Telephone	[redacted]
Facsimile	61 2 89079001
Email	[redacted]t@arcadis.com
Project	(Not specified)
Order Number	**17267**
Samples	24

LABORATORY DETAILS

Manager	[redacted]
Laboratory	SGS Melbourne EH&S
Address	10/585 Blackburn Road Notting Hill Victoria 3168
Telephone	+61[redacted]
Facsimile	+61395743399
Email	Au.SampleReceipt.Melbourne@sgs.com
Samples Received	Mon 2/10/2017
Report Due	Mon 16/10/2017
SGS Reference	**ME304337**

SUBMISSION DETAILS

This is to confirm that 24 samples were received on Monday 2/10/2017. Results are expected to be ready by COB Monday 16/10/2017. Please quote SGS reference ME304337 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	Ice Bricks
Samples received in correct containers	Yes	Sample counts by matrix	
Date documentation received		Type of documentation received	COC
Number of eskies/boxes received		Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	
Sufficient sample for analysis	Yes	Turnaround time requested	Standard

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

SGS

SAMPLE RECEIPT ADVICE

ME304337

CLIENT DETAILS

Client ARCADIS AUSTRALIA PACIFIC PTY LIMITED Project (Not specified)

SUMMARY OF ANALYSIS

No.	Sample ID	Perfluronated Surfactants in Soil - TOPS	Perfluronated Surfactants in Soils MA_1523.SL.01
001	BH1-0.05-0.15	33	33
004	BH2-0.0-0.2	-	33
007	BH3-0.0-0.1	33	33
010	BH4-0.0-0.2	-	33
012	BH5-0.0-0.2	-	33
014	BH6-0.0-0.2	33	33
016	BH7-0.0-0.2	33	33
018	BH8-0.02-0.2	-	33
020	BH9-0.02-0.2	-	33
022	BH10-0.1-0.2	33	33
024	QA1	33	33

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

9/10/2017

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS		LABORATORY DETAILS	
Contact	[redacted]	Manager	[redacted]
Client	ARCADIS AUSTRALIA PACIFIC PTY LIMITED	Laboratory	SGS Melbourne EH&S
Address	Unit 5, 9 Beaconsfield Street Fyshwick ACT 2609	Address	10/585 Blackburn Road Notting Hill Victoria 3168
Telephone	[redacted]	Telephone	+613[redacted]
Facsimile	61 2 89079001	Facsimile	+61395743399
Email	[redacted]@arcadis.com	Email	Au.SampleReceipt.Melbourne@sgs.com
Project	(Not specified)	SGS Reference	**ME304337 R1**
Order Number	**17267**	Date Received	02 Oct 2017
Samples	24	Date Reported	11 Oct 2017

COMMENTS

Accredited for compliance with ISO/IEC 17025- Testing. NATA accredited laboratory 2562(14420).

This report cancels and supersedes the report No. ME304337 R0. dated 10/Oct/2017 issued by SGS Environment, Health and Safety due to miscalculated data.

SIGNATORIES

[redacted]

[redacted]

SGS

ANALYTICAL REPORT

ME304337 R1

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	ME304337.001 Soil 22 Sep 2017 BH1-0.05-0.15	ME304337.002 Soil 22 Sep 2017 BH1-0.4-0.6	ME304337.003 Soil 22 Sep 2017 BH1-0.9-1.1	ME304337.004 Soil 22 Sep 2017 BH2-0.0-0.2
Moisture Content Method: AN002 Tested: 9/10/2017							
% Moisture*	%w/w	1		**4.2**	-	-	**4.4**
Perfluoronated Surfactants in Soil - TOPS Method: MA_1523_TOPS Tested: 4/10/2017							
10:2 Fluorotelomersulphonate*	mg/kg	0.02		<0.02	-	-	-
4-2 Fluorotelomersulphonate*	mg/kg	0.02		<0.02	-	-	-
6-2 Fluorotelomer Sulfonate*	mg/kg	0.02		<0.02	-	-	-
8:2 Fluorotelomersulphonate*	mg/kg	0.02		<0.02	-	-	-
N-Ethyl-heptadecafluorooctane sulphonamide*	mg/kg	0.02		<0.02	-	-	-
N-Ethyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.02		<0.02	-	-	-
N-Methyl-heptadecafluorooctane sulphonamide*	mg/kg	0.02		<0.02	-	-	-
N-Methyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.02		<0.02	-	-	-
Perfluorononanoic acid*	mg/kg	0.02		<0.02	-	-	-
Perfluorooctane sulfonate*	mg/kg	0.02		**0.02**	-	-	-
Perfluorooctanesulfonamidoacetic Acid*	mg/kg	0.02		<0.02	-	-	-
Perfluorooctanoic Acid*	mg/kg	0.02		<0.02	-	-	-
Perfluorobutanoic acid*	mg/kg	0.02		<0.02	-	-	-
Perfluorobutane sulfonate*	mg/kg	0.02		<0.02	-	-	-
Perfluorodecanoic acid*	mg/kg	0.02		<0.02	-	-	-
Perfluorodecane sulfonate*	mg/kg	0.02		<0.02	-	-	-
Perfluoro-1-dodecanesulfonate*	mg/kg	0.02		<0.02	-	-	-
Perfluorodecylphosphonic acid*	mg/kg	0.04		<0.04	-	-	-
Perfluorododecanoic acid*	mg/kg	0.02		<0.02	-	-	-
Perfluoro-1-heptanesulfonate*	mg/kg	0.02		<0.02	-	-	-
Perfluoro-1-nonanesulfonate*	mg/kg	0.02		<0.02	-	-	-
Perfluoroheptanoic acid*	mg/kg	0.02		<0.02	-	-	-
Perfluorohexanoic acid*	mg/kg	0.02		<0.02	-	-	-
Perfluoro-n-hexadecanoic acid*	mg/kg	0.02		<0.02	-	-	-
Perfluorohexane sulfonate*	mg/kg	0.02		<0.02	-	-	-
Perfluorohexylphosphonic acid*	mg/kg	0.02		<0.02	-	-	-
Perfluorooctadecanoic Acid*	mg/kg	0.02		<0.02	-	-	-
Perfluorooctylphosphonic acid*	mg/kg	0.02		**0.02**	-	-	-
Perfluorooctane sulfonamide*	mg/kg	0.02		**0.02**	-	-	-
Perfluoropentanoic acid*	mg/kg	0.02		<0.02	-	-	-
Perfluorotetradecanoic acid*	mg/kg	0.02		<0.02	-	-	-
Perfluorotridecanoic acid*	mg/kg	0.02		<0.02	-	-	-
Perfluoroundecanoic acid*	mg/kg	0.02		<0.02	-	-	-

SGS

ANALYTICAL REPORT

ME304337 R1

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	ME304337.001 Soil 22 Sep 2017 BH1-0.05-0.15	ME304337.002 Soil 22 Sep 2017 BH1-0.4-0.6	ME304337.003 Soil 22 Sep 2017 BH1-0.9-1.1	ME304337.004 Soil 22 Sep 2017 BH2-0.0-0.2
Perfluoronated Surfactants in Soils MA_1523.SL.01 Method: MA_1523 Tested: 10/10/2017							
10:2 Fluorotelomersulphonate*	mg/kg	0.01		<0.01	-	-	<0.01
4:2 Fluorotelomersulphonate*	mg/kg	0.01		<0.01	-	-	<0.01
6-2 Fluorotelomer Sulfonate*	mg/kg	0.01		<0.01	-	-	<0.01
8:2 Fluorotelomersulphonate*	mg/kg	0.01		<0.01	-	-	<0.01
N-Ethyl-heptadecafluorooctane sulphonamide*	mg/kg	0.01		<0.01	-	-	<0.01
Perfluorooctanesulfonamidoacetic acid (FOSAA)*	mg/kg	0.01		<0.01	-	-	<0.01
N-Ethyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.01		<0.01	-	-	<0.01
N-Methyl-heptadecafluorooctane sulphonamide*	mg/kg	0.01		<0.01	-	-	<0.01
N-Methyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.01		<0.01	-	-	<0.01
Perfluorononanoic acid	mg/kg	0.01		<0.01	-	-	<0.01
Perfluorooctane sulfonate	mg/kg	0.01		**0.02**	-	-	<0.01
Perfluorooctanoic Acid	mg/kg	0.01		<0.01	-	-	<0.01
Perfluorobutanoic acid*	mg/kg	0.01		<0.01	-	-	<0.01
Perfluorobutane sulfonate*	mg/kg	0.01		<0.01	-	-	<0.01
Perfluorodecanoic acid*	mg/kg	0.01		<0.01	-	-	<0.01
Perfluorodecane sulfonate*	mg/kg	0.01		<0.01	-	-	<0.01
Perfluoro-1-dodecanesulfonate (PFDoS)*	mg/kg	0.01		<0.01	-	-	<0.01
Perfluorodecylphosphonic acid (PFDPA)*	mg/kg	0.02		<0.02	-	-	**0.02**
Perfluorododecanoic acid*	mg/kg	0.01		<0.01	-	-	<0.01
Perfluoro-1-heptanesulfonate (PFHpS)*	mg/kg	0.01		<0.01	-	-	<0.01
Perfluoroheptanoic acid*	mg/kg	0.01		<0.01	-	-	<0.01
Perfluorohexanoic acid*	mg/kg	0.01		<0.01	-	-	<0.01
Perfluorohexylphosphonic acid (PFHxPA)*	mg/kg	0.01		<0.01	-	-	<0.01
Perfluoro-n-hexadecanoic acid (PFHxDA)*	mg/kg	0.01		<0.01	-	-	<0.01
Perfluoro-1-nonanesulfonate (PFNS)*	mg/kg	0.01		<0.01	-	-	<0.01
Perfluorohexane sulfonate*	mg/kg	0.01		<0.01	-	-	<0.01
Perfluorooctadecanoic Acid*	mg/kg	0.01		<0.01	-	-	<0.01
Perfluorooctylphosphonic acid (PFOPA)*	mg/kg	0.01		<0.01	-	-	**0.01**
Perfluoroctane sulfonamide*	mg/kg	0.01		<0.01	-	-	**0.02**
Perfluoropentanoic acid*	mg/kg	0.01		<0.01	-	-	<0.01
Perfluorotetradecanoic acid*	mg/kg	0.01		<0.01	-	-	<0.01
Perfluorotridecanoic acid*	mg/kg	0.01		<0.01	-	-	<0.01
Perfluoroundecanoic acid*	mg/kg	0.01		<0.01	-	-	<0.01

SGS

ANALYTICAL REPORT

ME304337 R1

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	ME304337.005 Soil 22 Sep 2017 BH2-0.4-0.6	ME304337.006 Soil 22 Sep 2017 BH2-0.9-1.1	ME304337.007 Soil 22 Sep 2017 BH3-0.0-0.1	ME304337.008 Soil 22 Sep 2017 BH3-0.4-0.6
Moisture Content Method: AN002 Tested: 10/10/2017							
% Moisture*	%w/w	1	-	-	**7.8**	-
Perfluoronated Surfactants in Soil - TOPS Method: MA_1523_TOPS Tested: 10/10/2017							
10:2 Fluorotelomersulphonate*	mg/kg	0.02	-	-	<0.02	-
4-2 Fluorotelomersulphonate*	mg/kg	0.02	-	-	<0.02	-
6-2 Fluorotelomer Sulfonate*	mg/kg	0.02	-	-	<0.02	-
8:2 Fluorotelomersulphonate*	mg/kg	0.02	-	-	<0.02	-
N-Ethyl-heptadecafluorooctane sulphonamide*	mg/kg	0.02	-	-	<0.02	-
N-Ethyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.02	-	-	<0.02	-
N-Methyl-heptadecafluorooctane sulphonamide*	mg/kg	0.02	-	-	<0.02	-
N-Methyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.02	-	-	<0.02	-
Perfluorononanoic acid*	mg/kg	0.02	-	-	<0.02	-
Perfluorooctane sulfonate*	mg/kg	0.02	-	-	**0.06**	-
Perfluorooctanesulfonamidoacetic Acid*	mg/kg	0.02	-	-	<0.02	-
Perfluorooctanoic Acid*	mg/kg	0.02	-	-	<0.02	-
Perfluorobutanoic acid*	mg/kg	0.02	-	-	<0.02	-
Perfluorobutane sulfonate*	mg/kg	0.02	-	-	<0.02	-
Perfluorodecanoic acid*	mg/kg	0.02	-	-	<0.02	-
Perfluorodecane sulfonate*	mg/kg	0.02	-	-	<0.02	-
Perfluoro-1-dodecanesulfonate*	mg/kg	0.02	-	-	<0.02	-
Perfluorodecylphosphonic acid*	mg/kg	0.04	-	-	<0.04	-
Perfluorododecanoic acid*	mg/kg	0.02	-	-	<0.02	-
Perfluoro-1-heptanesulfonate*	mg/kg	0.02	-	-	<0.02	-
Perfluoro-1-nonanesulfonate*	mg/kg	0.02	-	-	<0.02	-
Perfluoroheptanoic acid*	mg/kg	0.02	-	-	<0.02	-
Perfluorohexanoic acid*	mg/kg	0.02	-	-	<0.02	-
Perfluoro-n-hexadecanoic acid*	mg/kg	0.02	-	-	<0.02	-
Perfluorohexane sulfonate*	mg/kg	0.02	-	-	<0.02	-
Perfluorohexylphosphonic acid*	mg/kg	0.02	-	-	<0.02	-
Perfluorooctadecanoic Acid*	mg/kg	0.02	-	-	<0.02	-
Perfluorooctylphosphonic acid*	mg/kg	0.02	-	-	**0.02**	-
Perfluorooctane sulfonamide*	mg/kg	0.02	-	-	**0.02**	-
Perfluoropentanoic acid*	mg/kg	0.02	-	-	<0.02	-
Perfluorotetradecanoic acid*	mg/kg	0.02	-	-	<0.02	-
Perfluorotridecanoic acid*	mg/kg	0.02	-	-	<0.02	-
Perfluoroundecanoic acid*	mg/kg	0.02	-	-	<0.02	-

SGS

ANALYTICAL REPORT

ME304337 R1

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	ME304337.005 Soil 22 Sep 2017 BH2-0.4-0.6	ME304337.006 Soil 22 Sep 2017 BH2-0.9-1.1	ME304337.007 Soil 22 Sep 2017 BH3-0.0-0.1	ME304337.008 Soil 22 Sep 2017 BH3-0.4-0.6
Perfluoronated Surfactants in Soils MA_1523.SL.01 Method: MA_1523 Tested: 10/10/2017							
10:2 Fluorotelomersulphonate*	mg/kg	0.01		-	-	<0.01	-
4:2 Fluorotelomersulphonate*	mg/kg	0.01		-	-	<0.01	-
6-2 Fluorotelomer Sulfonate*	mg/kg	0.01		-	-	<0.01	-
8:2 Fluorotelomersulphonate*	mg/kg	0.01		-	-	<0.01	-
N-Ethyl-heptadecafluorooctane sulphonamide*	mg/kg	0.01		-	-	<0.01	-
Perfluorooctanesulfonamidoacetic acid (FOSAA)*	mg/kg	0.01		-	-	<0.01	-
N-Ethyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.01		-	-	<0.01	-
N-Methyl-heptadecafluorooctane sulphonamide*	mg/kg	0.01		-	-	<0.01	-
N-Methyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.01		-	-	<0.01	-
Perfluorononanoic acid	mg/kg	0.01		-	-	<0.01	-
Perfluorooctane sulfonate	mg/kg	0.01		-	-	**0.02**	-
Perfluorooctanoic Acid	mg/kg	0.01		-	-	<0.01	-
Perfluorobutanoic acid*	mg/kg	0.01		-	-	<0.01	-
Perfluorobutane sulfonate*	mg/kg	0.01		-	-	<0.01	-
Perfluorodecanoic acid*	mg/kg	0.01		-	-	<0.01	-
Perfluorodecane sulfonate*	mg/kg	0.01		-	-	<0.01	-
Perfluoro-1-dodecanesulfonate (PFDoS)*	mg/kg	0.01		-	-	<0.01	-
Perfluorodecylphosphonic acid (PFDPA)*	mg/kg	0.02		-	-	**0.02**	-
Perfluorododecanoic acid*	mg/kg	0.01		-	-	<0.01	-
Perfluoro-1-heptanesulfonate (PFHpS)*	mg/kg	0.01		-	-	<0.01	-
Perfluoroheptanoic acid*	mg/kg	0.01		-	-	<0.01	-
Perfluorohexanoic acid*	mg/kg	0.01		-	-	<0.01	-
Perfluorohexylphosphonic acid (PFHxPA)*	mg/kg	0.01		-	-	<0.01	-
Perfluoro-n-hexadecanoic acid (PFHxDA)*	mg/kg	0.01		-	-	<0.01	-
Perfluoro-1-nonanesulfonate (PFNS)*	mg/kg	0.01		-	-	<0.01	-
Perfluorohexane sulfonate*	mg/kg	0.01		-	-	<0.01	-
Perfluorooctadecanoic Acid*	mg/kg	0.01		-	-	<0.01	-
Perfluorooctylphosphonic acid (PFOPA)*	mg/kg	0.01		-	-	<0.01	-
Perfluoroctane sulfonamide*	mg/kg	0.01		-	-	**0.02**	-
Perfluoropentanoic acid*	mg/kg	0.01		-	-	<0.01	-
Perfluorotetradecanoic acid*	mg/kg	0.01		-	-	<0.01	-
Perfluorotridecanoic acid*	mg/kg	0.01		-	-	<0.01	-
Perfluoroundecanoic acid*	mg/kg	0.01		-	-	<0.01	-

SGS

ANALYTICAL REPORT

ME304337 R1

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	ME304337.009 Soil 22 Sep 2017 BH3-0.9-1.1	ME304337.010 Soil 22 Sep 2017 BH4-0.0-0.2	ME304337.011 Soil 22 Sep 2017 BH4-0.4-0.6	ME304337.012 Soil 22 Sep 2017 BH5-0.0-0.2
Moisture Content Method: AN002 Tested: 10/10/2017							
% Moisture*	%w/w	1	-	**7.4**	-	**7.5**
Perfluoronated Surfactants in Soil - TOPS Method: MA_1523_TOPS Tested: 10/10/2017							
10:2 Fluorotelomersulphonate*	mg/kg	0.02	-	-	-	-
4-2 Fluorotelomersulphonate*	mg/kg	0.02	-	-	-	-
6-2 Fluorotelomer Sulfonate*	mg/kg	0.02	-	-	-	-
8:2 Fluorotelomersulphonate*	mg/kg	0.02	-	-	-	-
N-Ethyl-heptadecafluorooctane sulphonamide*	mg/kg	0.02	-	-	-	-
N-Ethyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.02	-	-	-	-
N-Methyl-heptadecafluorooctane sulphonamide*	mg/kg	0.02	-	-	-	-
N-Methyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.02	-	-	-	-
Perfluorononanoic acid*	mg/kg	0.02	-	-	-	-
Perfluorooctane sulfonate*	mg/kg	0.02	-	-	-	-
Perfluorooctanesulfonamidoacetic Acid*	mg/kg	0.02	-	-	-	-
Perfluorooctanoic Acid*	mg/kg	0.02	-	-	-	-
Perfluorobutanoic acid*	mg/kg	0.02	-	-	-	-
Perfluorobutane sulfonate*	mg/kg	0.02	-	-	-	-
Perfluorodecanoic acid*	mg/kg	0.02	-	-	-	-
Perfluorodecane sulfonate*	mg/kg	0.02	-	-	-	-
Perfluoro-1-dodecanesulfonate*	mg/kg	0.02	-	-	-	-
Perfluorodecylphosphonic acid*	mg/kg	0.04	-	-	-	-
Perfluorododecanoic acid*	mg/kg	0.02	-	-	-	-
Perfluoro-1-heptanesulfonate*	mg/kg	0.02	-	-	-	-
Perfluoro-1-nonanesulfonate*	mg/kg	0.02	-	-	-	-
Perfluoroheptanoic acid*	mg/kg	0.02	-	-	-	-
Perfluorohexanoic acid*	mg/kg	0.02	-	-	-	-
Perfluoro-n-hexadecanoic acid*	mg/kg	0.02	-	-	-	-
Perfluorohexane sulfonate*	mg/kg	0.02	-	-	-	-
Perfluorohexylphosphonic acid*	mg/kg	0.02	-	-	-	-
Perfluorooctadecanoic Acid*	mg/kg	0.02	-	-	-	-
Perfluorooctylphosphonic acid*	mg/kg	0.02	-	-	-	-
Perfluorooctane sulfonamide*	mg/kg	0.02	-	-	-	-
Perfluoropentanoic acid*	mg/kg	0.02	-	-	-	-
Perfluorotetradecanoic acid*	mg/kg	0.02	-	-	-	-
Perfluorotridecanoic acid*	mg/kg	0.02	-	-	-	-
Perfluoroundecanoic acid*	mg/kg	0.02	-	-	-	-

SGS

ANALYTICAL REPORT

ME304337 R1

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	ME304337.009 Soil 22 Sep 2017 BH3-0.9-1.1	ME304337.010 Soil 22 Sep 2017 BH4-0.0-0.2	ME304337.011 Soil 22 Sep 2017 BH4-0.4-0.6	ME304337.012 Soil 22 Sep 2017 BH5-0.0-0.2
Perfluoronated Surfactants in Soils MA_1523.SL.01 Method: MA_1523 Tested: 10/10/2017							
10:2 Fluorotelomersulphonate*	mg/kg	0.01		-	<0.01	-	<0.01
4:2 Fluorotelomersulphonate*	mg/kg	0.01		-	<0.01	-	<0.01
6-2 Fluorotelomer Sulfonate*	mg/kg	0.01		-	<0.01	-	<0.01
8:2 Fluorotelomersulphonate*	mg/kg	0.01		-	<0.01	-	<0.01
N-Ethyl-heptadecafluorooctane sulphonamide*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorooctanesulfonamidoacetic acid (FOSAA)*	mg/kg	0.01		-	<0.01	-	<0.01
N-Ethyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.01		-	<0.01	-	<0.01
N-Methyl-heptadecafluorooctane sulphonamide*	mg/kg	0.01		-	<0.01	-	<0.01
N-Methyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorononanoic acid	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorooctane sulfonate	mg/kg	0.01		-	**0.14**	-	**0.04**
Perfluorooctanoic Acid	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorobutanoic acid*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorobutane sulfonate*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorodecanoic acid*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorodecane sulfonate*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluoro-1-dodecanesulfonate (PFDoS)*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorodecylphosphonic acid (PFDPA)*	mg/kg	0.02		-	<0.02	-	<0.02
Perfluorododecanoic acid*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluoro-1-heptanesulfonate (PFHpS)*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluoroheptanoic acid*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorohexanoic acid*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorohexylphosphonic acid (PFHxPA)*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluoro-n-hexadecanoic acid (PFHxDA)*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluoro-1-nonanesulfonate (PFNS)*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorohexane sulfonate*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorooctadecanoic Acid*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorooctylphosphonic acid (PFOPA)*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluoroctane sulfonamide*	mg/kg	0.01		-	**0.02**	-	**0.02**
Perfluoropentanoic acid*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorotetradecanoic acid*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorotridecanoic acid*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluoroundecanoic acid*	mg/kg	0.01		-	<0.01	-	<0.01

SGS

ANALYTICAL REPORT

ME304337 R1

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	ME304337.013 Soil 22 Sep 2017 BH5-0.4-0.6	ME304337.014 Soil 22 Sep 2017 BH6-0.0-0.2	ME304337.015 Soil 22 Sep 2017 BH6-0.4-0.6	ME304337.016 Soil 22 Sep 2017 BH7-0.0-0.2
Moisture Content Method: AN002 Tested: 10/10/2017							
% Moisture*	%w/w	1	-	**4.0**	-	**17.4**
Perfluoronated Surfactants in Soil - TOPS Method: MA_1523_TOPS Tested: 10/10/2017							
10:2 Fluorotelomersulphonate*	mg/kg	0.02	-	<0.02	-	<0.02
4-2 Fluorotelomersulphonate*	mg/kg	0.02	-	<0.02	-	<0.02
6-2 Fluorotelomer Sulfonate*	mg/kg	0.02	-	<0.02	-	<0.02
8:2 Fluorotelomersulphonate*	mg/kg	0.02	-	<0.02	-	<0.02
N-Ethyl-heptadecafluorooctane sulphonamide*	mg/kg	0.02	-	<0.02	-	<0.02
N-Ethyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.02	-	<0.02	-	<0.02
[illegible]-Methyl-heptadecafluorooctane sulphonamide*	mg/kg	0.02	-	<0.02	-	<0.02
[illegible]-Methyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.02	-	<0.02	-	**0.02**
Perfluorononanoic acid*	mg/kg	0.02	-	<0.02	-	<0.02
Perfluorooctane sulfonate*	mg/kg	0.02	-	**0.04**	-	**0.74**
Perfluorooctanesulfonamidoacetic Acid*	mg/kg	0.02	-	<0.02	-	<0.02
Perfluorooctanoic Acid*	mg/kg	0.02	-	<0.02	-	<0.02
Perfluorobutanoic acid*	mg/kg	0.02	-	<0.02	-	<0.02
Perfluorobutane sulfonate*	mg/kg	0.02	-	<0.02	-	<0.02
Perfluorodecanoic acid*	mg/kg	0.02	-	<0.02	-	<0.02
Perfluorodecane sulfonate*	mg/kg	0.02	-	<0.02	-	<0.02
Perfluoro-1-dodecanesulfonate*	mg/kg	0.02	-	<0.02	-	<0.02
Perfluorodecylphosphonic acid*	mg/kg	0.04	-	<0.04	-	<0.04
Perfluorododecanoic acid*	mg/kg	0.02	-	<0.02	-	<0.02
Perfluoro-1-heptanesulfonate*	mg/kg	0.02	-	<0.02	-	<0.02
Perfluoro-1-nonanesulfonate*	mg/kg	0.02	-	<0.02	-	<0.02
Perfluoroheptanoic acid*	mg/kg	0.02	-	<0.02	-	<0.02
Perfluorohexanoic acid*	mg/kg	0.02	-	<0.02	-	**0.06**
Perfluoro-n-hexadecanoic acid*	mg/kg	0.02	-	<0.02	-	<0.02
Perfluorohexane sulfonate*	mg/kg	0.02	-	<0.02	-	<0.02
Perfluorohexylphosphonic acid*	mg/kg	0.02	-	<0.02	-	**0.02**
Perfluorooctadecanoic Acid*	mg/kg	0.02	-	<0.02	-	<0.02
Perfluorooctylphosphonic acid*	mg/kg	0.02	-	<0.02	-	<0.02
[illegible]erfluoroctane sulfonamide*	mg/kg	0.02	-	**0.02**	-	**0.02**
[illegible]erfluoropentanoic acid*	mg/kg	0.02	-	<0.02	-	<0.02
Perfluorotetradecanoic acid*	mg/kg	0.02	-	<0.02	-	<0.02
Perfluorotridecanoic acid*	mg/kg	0.02	-	<0.02	-	<0.02
Perfluoroundecanoic acid*	mg/kg	0.02	-	<0.02	-	<0.02

SGS

ANALYTICAL REPORT

ME304337 R1

Parameter	Units	LOR	Sample Number	ME304337.013	ME304337.014	ME304337.015	ME304337.016
			Sample Matrix	Soil	Soil	Soil	Soil
			Sample Date	22 Sep 2017	22 Sep 2017	22 Sep 2017	22 Sep 2017
			Sample Name	BH5-0.4-0.6	BH6-0.0-0.2	BH6-0.4-0.6	BH7-0.0-0.2
Perfluoronated Surfactants in Soils MA_1523.SL.01 Method: MA_1523 Tested: 10/10/2017							
10:2 Fluorotelomersulphonate*	mg/kg	0.01		-	<0.01	-	<0.01
4:2 Fluorotelomersulphonate*	mg/kg	0.01		-	<0.01	-	<0.01
6-2 Fluorotelomer Sulfonate*	mg/kg	0.01		-	<0.01	-	<0.01
8:2 Fluorotelomersulphonate*	mg/kg	0.01		-	<0.01	-	<0.01
N-Ethyl-heptadecafluorooctane sulphonamide*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorooctanesulfonamidoacetic acid (FOSAA)*	mg/kg	0.01		-	<0.01	-	<0.01
N-Ethyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.01		-	<0.01	-	<0.01
N-Methyl-heptadecafluorooctane sulphonamide*	mg/kg	0.01		-	<0.01	-	<0.01
N-Methyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorononanoic acid	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorooctane sulfonate	mg/kg	0.01		-	**0.04**	-	**0.50**
Perfluorooctanoic Acid	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorobutanoic acid*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorobutane sulfonate*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorodecanoic acid*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorodecane sulfonate*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluoro-1-dodecanesulfonate (PFDoS)*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorodecylphosphonic acid (PFDPA)*	mg/kg	0.02		-	<0.02	-	<0.02
Perfluorododecanoic acid*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluoro-1-heptanesulfonate (PFHpS)*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluoroheptanoic acid*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorohexanoic acid*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorohexylphosphonic acid (PFHxPA)*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluoro-n-hexadecanoic acid (PFHxDA)*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluoro-1-nonanesulfonate (PFNS)*	mg/kg	0.01		-	<0.01	-	**0.02**
Perfluorohexane sulfonate*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorooctadecanoic Acid*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorooctylphosphonic acid (PFOPA)*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluoroctane sulfonamide*	mg/kg	0.01		-	**0.02**	-	**0.02**
Perfluoropentanoic acid*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorotetradecanoic acid*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluorotridecanoic acid*	mg/kg	0.01		-	<0.01	-	<0.01
Perfluoroundecanoic acid*	mg/kg	0.01		-	<0.01	-	<0.01

SGS

ANALYTICAL REPORT

ME304337 R1

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	ME304337.017 Soil 22 Sep 2017 BH7-0.4-0.6	ME304337.018 Soil 22 Sep 2017 BH8-0.02-0.2	ME304337.019 Soil 22 Sep 2017 BH8-0.4-0.6	ME304337.020 Soil 22 Sep 2017 BH9-0.02-0.2
Moisture Content Method: AN002 Tested: 10/10/2017							
% Moisture*	%w/w	1		-	**5.1**	-	**6.1**
Perfluoronated Surfactants in Soil - TOPS Method: MA_1523_TOPS Tested: 10/10/2017							
10:2 Fluorotelomersulphonate*	mg/kg	0.02		-	-	-	-
4-2 Fluorotelomersulphonate*	mg/kg	0.02		-	-	-	-
6-2 Fluorotelomer Sulfonate*	mg/kg	0.02		-	-	-	-
8:2 Fluorotelomersulphonate*	mg/kg	0.02		-	-	-	-
N-Ethyl-heptadecafluorooctane sulphonamide*	mg/kg	0.02		-	-	-	-
N-Ethyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.02		-	-	-	-
N-Methyl-heptadecafluorooctane sulphonamide*	mg/kg	0.02		-	-	-	-
N-Methyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.02		-	-	-	-
Perfluorononanoic acid*	mg/kg	0.02		-	-	-	-
Perfluorooctane sulfonate*	mg/kg	0.02		-	-	-	-
Perfluorooctanesulfonamidoacetic Acid*	mg/kg	0.02		-	-	-	-
Perfluorooctanoic Acid*	mg/kg	0.02		-	-	-	-
Perfluorobutanoic acid*	mg/kg	0.02		-	-	-	-
Perfluorobutane sulfonate*	mg/kg	0.02		-	-	-	-
Perfluorodecanoic acid*	mg/kg	0.02		-	-	-	-
Perfluorodecane sulfonate*	mg/kg	0.02		-	-	-	-
Perfluoro-1-dodecanesulfonate*	mg/kg	0.02		-	-	-	-
Perfluorodecylphosphonic acid*	mg/kg	0.04		-	-	-	-
Perfluorododecanoic acid*	mg/kg	0.02		-	-	-	-
Perfluoro-1-heptanesulfonate*	mg/kg	0.02		-	-	-	-
Perfluoro-1-nonanesulfonate*	mg/kg	0.02		-	-	-	-
Perfluoroheptanoic acid*	mg/kg	0.02		-	-	-	-
Perfluorohexanoic acid*	mg/kg	0.02		-	-	-	-
Perfluoro-n-hexadecanoic acid*	mg/kg	0.02		-	-	-	-
Perfluorohexane sulfonate*	mg/kg	0.02		-	-	-	-
Perfluorohexylphosphonic acid*	mg/kg	0.02		-	-	-	-
Perfluorooctadecanoic Acid*	mg/kg	0.02		-	-	-	-
Perfluorooctylphosphonic acid*	mg/kg	0.02		-	-	-	-
Perfluoroctane sulfonamide*	mg/kg	0.02		-	-	-	-
Perfluoropentanoic acid*	mg/kg	0.02		-	-	-	-
Perfluorotetradecanoic acid*	mg/kg	0.02		-	-	-	-
Perfluorotridecanoic acid*	mg/kg	0.02		-	-	-	-
Perfluoroundecanoic acid*	mg/kg	0.02		-	-	-	-

SGS

ANALYTICAL REPORT

ME304337 R1

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	ME304337.017 Soil 22 Sep 2017 BH7-0.4-0.6	ME304337.018 Soil 22 Sep 2017 BH8-0.02-0.2	ME304337.019 Soil 22 Sep 2017 BH8-0.4-0.6	ME304337.020 Soil 22 Sep 2017 BH9-0.02-0.2
Perfluoronated Surfactants in Soils MA_1523.SL.01 Method: MA_1523 Tested: 10/10/2017							
10:2 Fluorotelomersulphonate*	mg/kg	0.01	-	<0.01	-	<0.01
4:2 Fluorotelomersulphonate*	mg/kg	0.01	-	<0.01	-	<0.01
6-2 Fluorotelomer Sulfonate*	mg/kg	0.01	-	<0.01	-	<0.01
8:2 Fluorotelomersulphonate*	mg/kg	0.01	-	<0.01	-	<0.01
N-Ethyl-heptadecafluorooctane sulphonamide*	mg/kg	0.01	-	<0.01	-	<0.01
Perfluorooctanesulfonamidoacetic acid (FOSAA)*	mg/kg	0.01	-	<0.01	-	<0.01
N-Ethyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.01	-	<0.01	-	<0.01
N-Methyl-heptadecafluorooctane sulphonamide*	mg/kg	0.01	-	<0.01	-	<0.01
N-Methyl-heptadecafluorooctane sulphonamidoethanol*	mg/kg	0.01	-	<0.01	-	<0.01
Perfluorononanoic acid	mg/kg	0.01	-	<0.01	-	<0.01
Perfluorooctane sulfonate	mg/kg	0.01	-	**0.22**	-	**0.08**
Perfluorooctanoic Acid	mg/kg	0.01	-	<0.01	-	<0.01
Perfluorobutanoic acid*	mg/kg	0.01	-	<0.01	-	<0.01
Perfluorobutane sulfonate*	mg/kg	0.01	-	<0.01	-	<0.01
Perfluorodecanoic acid*	mg/kg	0.01	-	<0.01	-	<0.01
Perfluorodecane sulfonate*	mg/kg	0.01	-	<0.01	-	<0.01
Perfluoro-1-dodecanesulfonate (PFDoS)*	mg/kg	0.01	-	<0.01	-	<0.01
Perfluorodecylphosphonic acid (PFDPA)*	mg/kg	0.02	-	<0.02	-	<0.02
Perfluorododecanoic acid*	mg/kg	0.01	-	<0.01	-	<0.01
Perfluoro-1-heptanesulfonate (PFHpS)*	mg/kg	0.01	-	<0.01	-	<0.01
Perfluoroheptanoic acid*	mg/kg	0.01	-	<0.01	-	<0.01
Perfluorohexanoic acid*	mg/kg	0.01	-	<0.01	-	**0.02**
Perfluorohexylphosphonic acid (PFHxPA)*	mg/kg	0.01	-	**0.03**	-	**0.05**
Perfluoro-n-hexadecanoic acid (PFHxDA)*	mg/kg	0.01	-	<0.01	-	<0.01
Perfluoro-1-nonanesulfonate (PFNS)*	mg/kg	0.01	-	<0.01	-	<0.01
Perfluorohexane sulfonate*	mg/kg	0.01	-	**0.02**	-	**0.06**
Perfluorooctadecanoic Acid*	mg/kg	0.01	-	<0.01	-	<0.01
Perfluorooctylphosphonic acid (PFOPA)*	mg/kg	0.01	-	<0.01	-	<0.01
Perfluoroctane sulfonamide*	mg/kg	0.01	-	**0.02**	-	<0.01
Perfluoropentanoic acid*	mg/kg	0.01	-	<0.01	-	<0.01
Perfluorotetradecanoic acid*	mg/kg	0.01	-	<0.01	-	<0.01
Perfluorotridecanoic acid*	mg/kg	0.01	-	<0.01	-	<0.01
Perfluoroundecanoic acid*	mg/kg	0.01	-	<0.01	-	<0.01