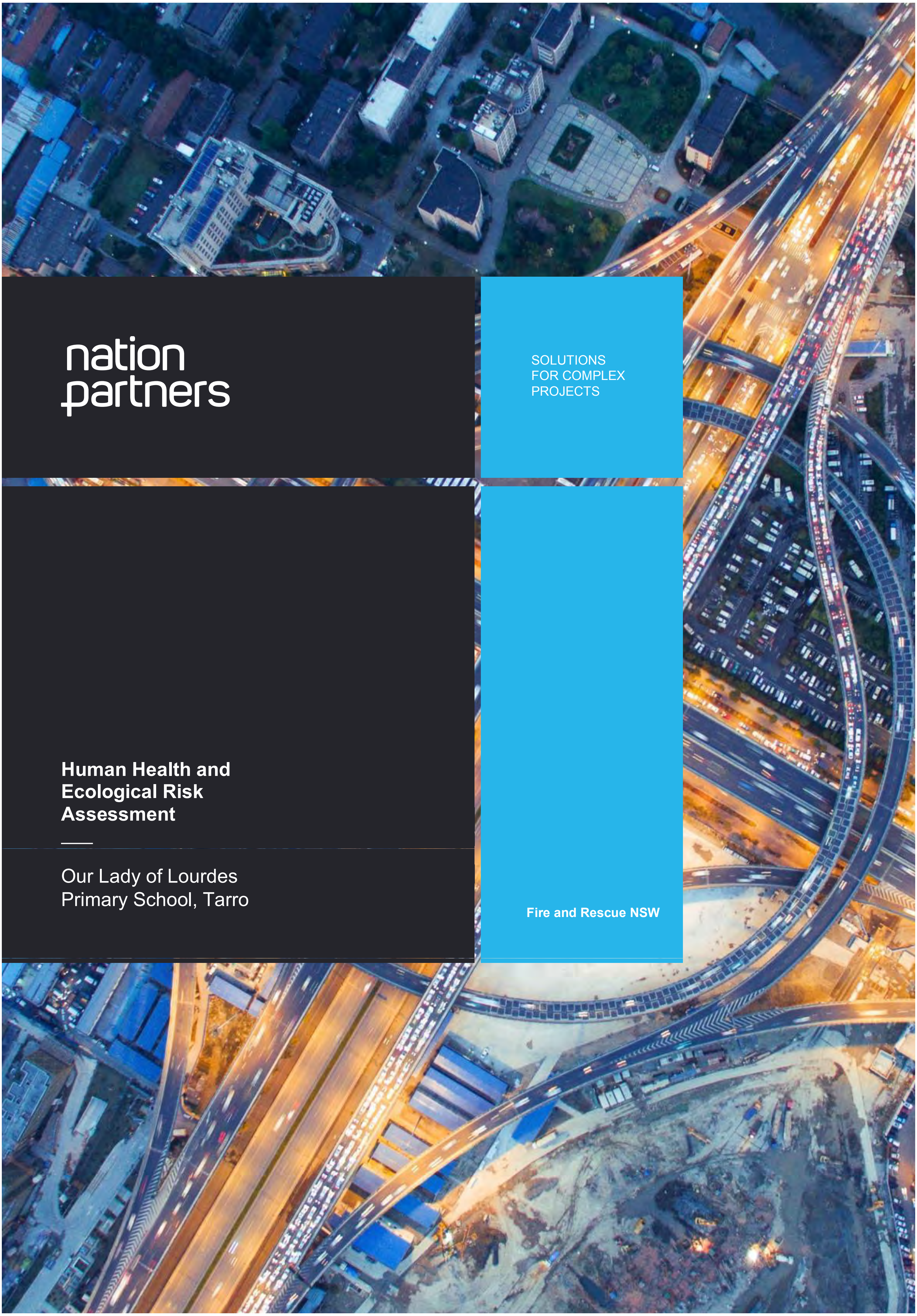

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Executive Summary

Nation Partners Pty Ltd (Nation Partners) has been engaged by Fire and Rescue NSW (FRNSW) to conduct a Human Health and Ecological Risk Assessment (HHERA) to better understand the potential for risks associated with the presence of per- and polyfluoroalkyl substances (PFAS) at Our Lady of Lourdes (OLOL) Primary School, Tarro, New South Wales (NSW) (the site).

Due to the historical use of legacy aqueous film forming foams (AFFF) at Tarro Fire Station, located adjacent to the site, FRNSW initiated a detailed site investigation (DSI) to assess the nature and extent of PFAS contamination present in an area that was formerly used for fire training and has subsequently become part of OLOL Primary School. The objective of the HHERA was to assess the potential for unacceptable risks to potential future on-site receptors and current off-site receptors associated with the potential exposure to PFAS present in environmental media as a result of historical fire training activities undertaken at the site. Consistent with the *Contaminated Land Management Act 1997* (NSW), this HHERA has been conducted based on the framework outlined in the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (as amended 2013) (NEPC, 2013), and other relevant Australian guidance.

The first phase of the detailed environmental investigation, the Sampling, Analysis and Quality Plan (SAQP) included the preliminary site investigation (PSI) components. The SAQP provided a review of historical contamination sources and activities at the site and the site's environmental setting. The SAQP identified areas of potential interest and data gaps in the understanding of the preliminary conceptual site model (CSM) for further environmental investigation in the DSI. The DSI was completed by Nation Partners and reported in December 2019. Sampling and analysis of various media was completed in the investigation area to assess the nature and extent of PFAS contamination and refine the CSM. The CSM identified contamination sources, and pathways from sources to potential receptors (people and the environment). The CSM also indicated that a number of exposure pathways are incomplete (i.e. contamination sources are not connected to people or the environment), particularly in relation to the exposure risks to people using OLOL Primary School from surface and near surface soils, surface water, groundwater, tanked rainwater and currently grown produce. Pathways associated with the risk to human receptors from multiple exposure routes, including proposed expanded produce use on-site and potential exposures associated with off-site migration, required further assessment. On this basis, the DSI recommended that this HHERA be undertaken.

As part of this HHERA, additional soil, groundwater, sediment and surface water sampling was completed by Nation Partners (see **Appendix A**). In addition, in preparing the HHERA, Nation Partners has relied upon the data and information presented in the following documents:

» Nation Partners, 2019a. Detailed Site Investigation Report – PFAS Investigation (DSI). December 2019.

» Nation Partners, 2019b. Addendum 1 to Detailed Site Investigation Report – PFAS Investigation. December 2019.

Exposure Assessment:

Based on the CSM, the following receptor groups have been considered as part of the HHERA:

» Adults and children that work at or attend OLOL Primary School;

» Residents (adults and children) that live on properties adjacent to the site;

» Recreational receptors that use Tarro Reserve for recreational activities; and

» Ecological receptors that inhabit or forage within Tarro Reserve.

Exposure pathways that have been considered in this HHERA for the above listed receptors have been summarised in **Table E1** below.

Table E1: Summary of Exposure Pathways Considered in the HHERA

Exposure Pathway	Complete (Yes/No)	Comments
Adults and children that work at or attend OLOL Primary School		
Incidental ingestion of soil and Inhalation of dust generated from on-site soils	Yes	The DSI identified that exposure to PFAS impacts in soil as a result of incidental ingestion and dust inhalation for adults and children is low and acceptable. However, for the purpose of understanding the cumulative exposures to all exposure pathways on-site this exposure pathway has been considered to be complete for these receptors.
Future Exposure Pathway – Ingestion of home grown produce	Yes	OLOL have indicated that there is a potential for additional garden beds to be constructed at the site for the purpose of growing fruits and vegetables for human consumption. This future exposure pathway has been assessed to inform the design process.
Future Exposure Pathway – ingestion of chicken eggs collected from the site	Yes	OLOL have indicated that there is a potential for chickens to be housed at the site for the purpose of collecting eggs for human consumption. This exposure pathway has been assessed to inform the decision process with regard to chickens at the site.
Residents (adults and children) that live on properties adjacent to the site		
Incidental ingestion of soil and Inhalation of dust generated from on-site soils	Yes	Sampling of surface soils along the nature strip indicates that there is potential for PFAS to be present in surface soils in residential properties. Although the reported concentrations are below public open space screening criteria, this exposure pathway has been considered to enable assessment of cumulative exposures from multiple exposure pathways.
Ingestion of home grown produce (fruits and vegetables)	Yes	During the water use survey some participants indicated that they grow fruits and vegetables in their gardens. Due to the limited nature of off-site soil samples this exposure pathway has been assessed to evaluate the potential for risks to these receptors.
Ingestion of chicken eggs from chickens kept in residential gardens	No	This exposure pathway was not identified to be complete for off-site residents near the site under current land use conditions.
Recreational receptors that use Tarro Reserve for recreational activities		
Incidental ingestion of surface water and sediments	Yes	There is potential for recreational users of Tarro Reserve to enter the waterway for the purposes of primary contact recreation (swimming). However, the water use survey did not indicate that local residents are utilising Tarro Reserve for the purpose of primary contact recreation.

Exposure Pathway	Complete (Yes/No)	Comments
Ingestion of aquatic biota from Tarro Reserve	No	Local residents indicated that fishing was not undertaken within Tarro Reserve due to proximity to popular fishing waterways such as the Hunter River and Nelson Bay.
Ecological receptors that inhabit or forage within Tarro Reserve		
Ingestion of soil/sediment during foraging activities	Yes	The presence of PFAS in stormwater discharging to Tarro Reserve, and in surface water bodies in the reserve and adjacent wetland, indicates that there is potential for ecological receptors to be exposed as a result of ingestion of environmental media and as a result of the ingestion of PFAS accumulated within biota.
Ingestion of surface water within Tarro Reserve	Yes	
Ingestion of aquatic and terrestrial biota in Tarro Reserve	Yes	

Conclusions:

On the basis of the available data and the assessment presented herein, and with consideration of identified uncertainties and data limitations the following conclusions are presented:

» Risks of exposure to PFAS to adults and children that attend OLOL Primary School, and who may consume home grown produce grown on the site (assumed to consist of up to 10% of their diet of fruits and vegetables) have been estimated to be low and acceptable in accordance with nationally published guidance;

» There is potential for unacceptable risks of exposure to PFAS under future land use conditions where chickens are housed in the DSI investigation area (**Figure F2**) at the site for the purposes of laying eggs for human consumption;

» Risks of exposure to PFAS to residents (adults and children) that inhabit the properties adjacent to the site, and who consume home grown produce (fruits and vegetables) from their gardens, have been estimated to be low and acceptable in accordance with nationally published guidance;

» Risks of exposure to PFAS to recreational receptors that use Tarro Reserve for swimming purposes were estimated to be low and acceptable in accordance with nationally published guidance; and

» Risks of exposure to PFAS to ecological receptors that may forage at the site and in surrounding areas, including within Tarro Reserve, are potentially unacceptable based on comparison of reported concentrations in soil and surface water with Tier 1 screening values. However, given the highly modified nature of the on-site and off-site environments it is considered likely that ecological receptors consist primarily of common urban species that are known to be less sensitive to environmental impacts compared to native species that inhabit less disturbed/modified environments.

Recommendations:

Given the above conclusions the following recommendations are provided:

» Given the potential for PFAS uptake to occur into chicken eggs, it is recommended that chickens are not housed within the investigation area of the site. If chickens are housed on-site in the future, it is recommended that soils in the proposed location be tested to confirm that consumption of chicken eggs would not increase the potential for PFAS exposures.

- As a precautionary approach it is recommend that wherever possible vegetable gardens should be within raised garden beds. It is noted that this is consistent with the current approach to produce garden configurations at the site.
- It is recommended that wherever possible, efforts should be made to minimise the potential for PFAS to leach from soils within the source area of the site into groundwater and surface water to minimise the potential for transport of PFAS away from the site.
- An ongoing monitoring program should be implemented to measure on-site and off-site surface water and groundwater concentrations over time. This will allow an assessment of changes in the potential for PFAS transport and will inform potential future risk management decisions.

Acronyms and Abbreviations

6:2 FTSA	6:2 Fluorotelomer Sulfonic Acid
AFFF	Aqueous Film Forming Foam
ANZG	Australian and New Zealand Governments
ASC NEPM	National Environment Protection (Assessment of Site Contamination) Measure
ATSDR	Agency for Toxic Substance and Disease Registry
CBD	Central Business District
CoPC	Contaminant of Potential Concern
CRC CARE	Cooperative Research Council for Contamination Assessment and Remediation of the Environment
CSM	Conceptual Site Model
DQI	Data Quality Indicator
DQO	Data Quality Objectives
DSI	Detailed Site Investigation
ECCC	Environment and Climate Change Canada
EFSA	European Food Safety Authority
enHealth	Environmental Health Standing Committee, Australian Health Protection Principal Committee
EPA	Environment Protection Authority
EPC	Exposure Point Concentration
EQL	Estimated Quantification Limit (also known as laboratory limit of reporting)
ERA	Ecological Risk Assessment
FRNSW	Fire and Rescue NSW
FSANZ	Food Standards Australia New Zealand
FTS	Fluorotelomer Sulfonic Acids
GDE	Groundwater Dependent Ecosystem
HBGV	Health Based Guideline Value
HED	Human Equvalent Dose
HEPA	Heads of Environment Protection Authority
HHERA	Human Health and Ecological Risk Assessment
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient

IDE	Inflow Dependent Ecosystem
km	Kilometres
L	Litres
m	Metre
m bgl	Metres Below Ground Level
m^2	Square Metres
mg/kg	Milligram per kilogram
mg/m^3	Milligrams per cubic metre
MRL	Minimal Risk Level
N-EtFOSA	N-ethyl perfluorooctane sulfonamide
N-EtFOSAA	N-ethyl perfluorooctane sulfonamidoacetic acid
N-EtFOSE	N-ethyl perfluorooctane sulfonamidoethanol
N-MeFOSA	N-methyl perfluorooctane sulfonamide
N-MeFOSAA	N-methyl perfluorooctane sulfonamidoacetic acid
N-MeFOSE	N-methyl perfluorooctane sulfonamidoethanol
NEMP	National Environment Management Plan
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
NOAEL	No Observable Adverse Effects Level
NSW	New South Wales
OEH	Office of Environment and Heritage
OLOL	Our Lady of Lourdes
PFAA	Perfluoroalkyl Acid
PFAS	Per- and Poly-Fluoroalkyl Substances
PFAS NEMP	PFAS National Environmental Management Plan
PFBA	Perfluorobutanoic Acid
PFBS	Perfluorobutane Sulfonic Acid
PFCA	Perfluoroalkane Carboxylic Acids
PFDA	Perfluorodecanoic Acid
PFDoDA	Perfluorododecanoic Acid
PFDS	Perfluorodecane Sulfonic Acid
PFHpA	Perfluoroheptanoic Acid
PFHpS	Perfluoroheptane Sulfonic Acid
PFHxA	Perfluorohexanoic Acid

PFHxS	Perfluorohexane Sulfonate
PFHxS	Perfluorohexane Sulfonate
PFNA	Perfluorononanoic Acid
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PFOSA	Perfluorooctane Sulfonamide
PFPeA	Perfluoropentanoic Acid
PFPeS	Perfluoropentane Sulfonic Acid
PFSA	Perfluoroalkane Sulfonic Acids
PFTeDA	Perfluorotetradecanoic Acid
PFTriDA	Perfluorotridecanoic Acid
PFUnDA	Perfluoroundecanoic Acid
PM	Particulate Matter
POD	Point of Departure
QA/QC	Quality Assurance/Quality Control
RfC	Reference Concentration
RfD	Reference Dose
SPR	Source-Pathway-Receptor
SW	Surface Water Sample
SWL	Standing Water Level
TDI	Tolerable Daily Intake
UF	Uncertainty Factor
UKCOT	United Kingdom Committee on Toxicity
USEPA	United States Environment Protection Agency
WHO	World Health Organisation
µg/kg	Micrograms per kilogram
µg/L	Micrograms per litre

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1. Introduction

Nation Partners Pty Ltd (Nation Partners) has been engaged by Fire and Rescue NSW (FRNSW) to conduct a Human Health and Ecological Risk Assessment (HHERA) to better understand the potential for risks associated with the presence of per- and polyfluoroalkyl substances (PFAS) at Our Lady of Lourdes (OLOL) Primary School, Tarro, New South Wales (NSW) (the site). The site's location is shown on the attached **Figure F1**.

1.1 Background

Aqueous Film Forming Foams (AFFF) are 'Class B' firefighting foams used to prevent or extinguish flammable liquid fires. AFFF forms a barrier that inhibits oxygen from feeding the fire, whilst limiting volatilisation of flammable vapours from fuels. Historically (from the 1970s), FRNSW used AFFF that contained perfluorooctane sulfonate (PFOS), perfluorohexane sulfonate (PFHxS), and perfluorooctanoic acid (PFOA) (herein referred to as legacy AFFF).

In 2007, FRNSW ceased using legacy AFFF at its fire stations and training sites. However, the chemical characteristics of PFAS make them highly resistant to degradation. Consequently, PFAS compounds may persist in environmental media such as soil, sediments, groundwater, surface water and biota for many years after the release(s) occurred. PFAS are highly water soluble and leach from solid materials (such as soil, sediment or concrete) into surface water or groundwater and can be dispersed widely from source areas. PFAS also have the potential to bioaccumulate in plants and animals.

Due to the historical use of legacy AFFF at Tarro Fire Station, located adjacent to the site, FRNSW initiated an investigation to assess the nature and extent of PFAS contamination present in an area that was formerly used for fire training and has subsequently become part of OLOL Primary School. This area is herein referred to as the 'investigation area' and is shown in the attached **Figure F2**. The investigation is part of a broader program being undertaken by FRNSW across NSW to manage this legacy issue (see https://www.fire.nsw.gov.au/page.php?id=9170).

A detailed site investigation (DSI) was completed by Nation Partners and reported in December 2019. The DSI focused on the investigation area where preliminary investigations indicated there was potential for historical contamination from FRNSW training activities. Sampling and analysis of various media was completed in the investigation area to assess the nature and extent of PFAS contamination and prepare a conceptual site model (CSM). The CSM identified contamination sources, and pathways from sources to potential receptors (people and the environment). The CSM also indicated that a number of exposure pathways are incomplete (i.e. contamination sources are not connected to people or the environment), particularly in relation to the exposure risks to people using OLOL Primary School from surface and near surface soils, surface water, groundwater, tanked rainwater and currently grown produce. Pathways associated with the risk to human receptors from multiple exposure routes, including proposed expanded produce use on-site and potential exposures associated with off-site migration, required further assessment.

1.2 Objectives

The objective of the HHERA was to assess the potential for unacceptable risks to current off-site receptors associated with the potential exposure to PFAS present in environmental media as a result of historical fire training activities undertaken at the site.

It is noted that risks to current users of the site (teachers and children) were assessed as part of the DSI and determined to be low and acceptable based on the current land use setting. However, the HHERA has also assessed the potential for unacceptable risks that may arise from the future land use settings proposed for the site. The proposed future uses assessed in the HHERA are construction of additional garden beds for home grown produce and keeping chickens for egg consumption purposes. The HHERA has assumed that home grown produce may be grown directly in soils currently present in the investigation area, and chickens may be kept in the investigation area.

No consideration of risks to intrusive maintenance workers both on-site and off-site has been included herein as reported PFAS concentrations in soils at the site are an order of magnitude below the adopted commercial/industrial land use screening criteria. Refer to the DSI report available at https://www.fire.nsw.gov.au/page.php?id=9322 for further details (Nation Partners, 2019a).

1.3 Risk Assessment Framework and Methodology

This HHERA has been prepared in consultation with various stakeholders including the site owners, site users and the NSW Government in accordance with relevant nationally adopted guidance.

Consistent with the *Contaminated Land Management Act, 1997* (NSW), this HHERA has been conducted based on the framework outlined in the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (as amended 2013) (NEPC, 2013).

1.3.1 Human Health Risk Assessment

The human health risk assessment (HHRA) component of this risk assessment has been conducted in accordance with the framework and methodology specified in the following nationally adopted guidance documents:

» Environmental Health Risk Assessment, Guidelines for Assessing Human Health Risks from Environmental Hazards. Department of Health and Aging, 2012 Update (enHealth, 2012);

» National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) (NEPC, 2013), specifically:

  – Schedule B4, Guideline on Site-specific Human Health Risk Assessment Methodology;

  – Schedule B7 Guideline on Derivation of Health-Based Investigation Levels; and

» PFAS National Environment Management Plan 2018 (NEMP). Heads of EPA (HEPA) (HEPA, 2018).

In accordance with the above documents, the HHRA process comprises the following elements.

» **Issue Identification**, which includes identification of the objectives of the risk assessment, the problems that the risk assessment needs to address and the risk management decisions that need to be made based on the HHRA. A key component of this stage is development of preliminary conceptual model describing the sources, receptors and exposure pathways that will be evaluated (**Section 3**).

» **Data Collection and Evaluation**, which includes review of available data and information, and identification of the contaminants of potential concern (CoPC) requiring detailed quantitative consideration in the risk assessment. CoPC are usually selected for detailed assessment based on comparison to published health-based guidance values which are based on conservative exposure assumptions and designed to be protective of most exposed populations. These are commonly referred to as ‘Tier 1’ screening levels (**Sections 4** and **Appendix A**).

» **Toxicity Assessment**, which includes evaluation of both qualitative and quantitative information about the toxicity of identified CoPC, in order to describe the nature and incidence of adverse health effects which could occur in humans at different exposure levels. (**Section 6**).

» **Exposure Assessment**, which includes identification of exposed human populations (receptors) and the pathways via which they may be exposed to CoPC and derivation of quantitative estimates of exposure point concentrations and contaminant intakes for each pathway (**Sections 5** and **Section 7**)

» **Risk Characterisation**, which involves comparison of estimated exposure levels to relevant toxicity (dose-response) criteria to estimate the potential incidence and nature of adverse health effects to human receptors. The risk characterisation stage also includes interpretation of risk estimates in the context of the uncertainties and assumptions of the risk assessment process (**Section 7.2**).

In accordance with the above listed documents, the HHRA process has included the elements as shown in **Figure 1** below.

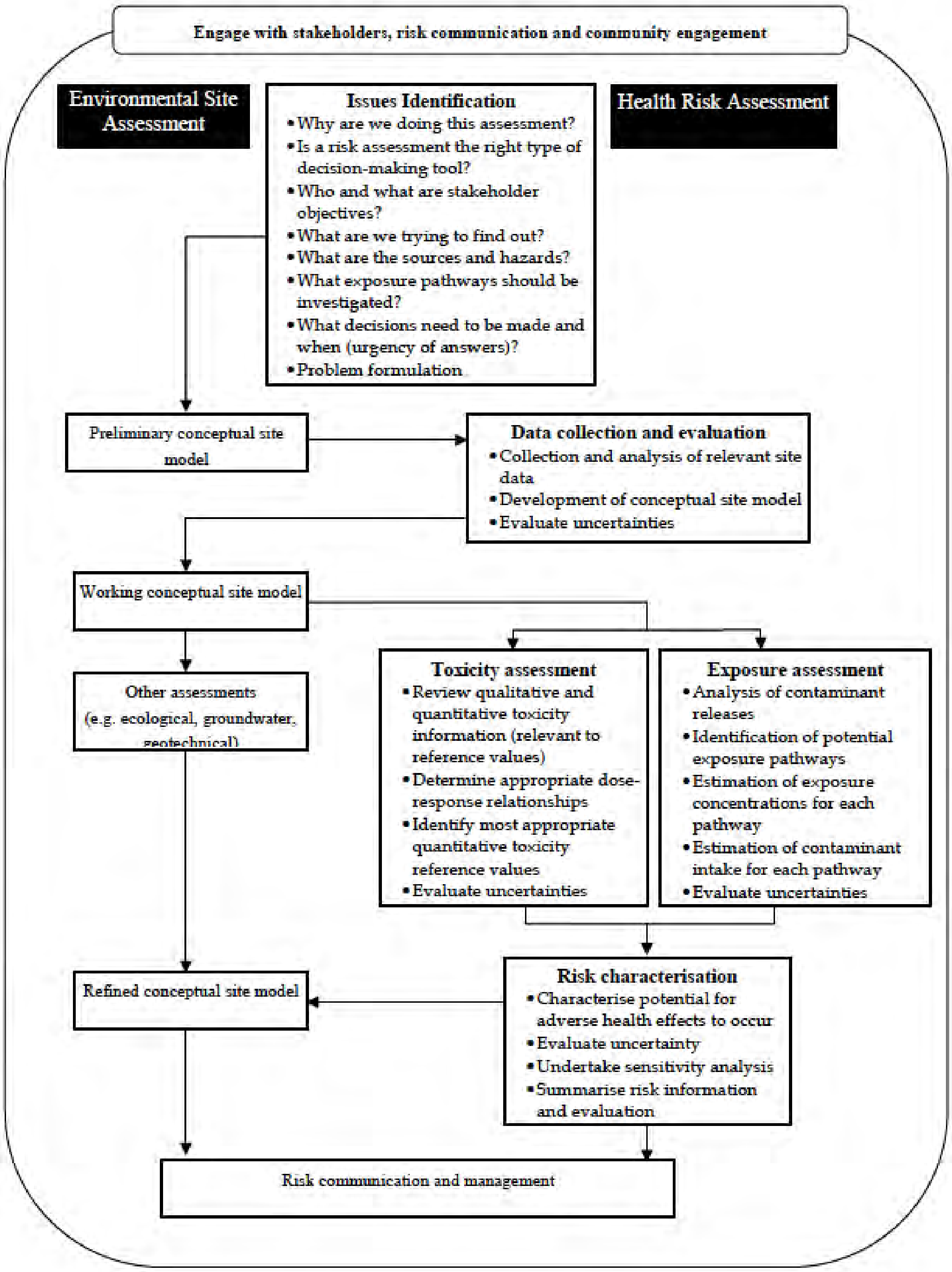

Figure 1: Risk Assessment Framework for Contaminated Sites
(source: ASC NEPM Schedule B4)

It is noted that there is potential for human receptors to be exposed to multiple PFAS during the exposure scenarios assessed both on- and off-site. Consideration of the potential risks associated with cumulative exposures to PFAS has been discussed in **Section 4.6** and **Section 7.2**.

1.3.2 Ecological Risk Assessment

The ecological risk assessment (ERA) component of the HHERA was undertaken with consideration of the following Australian guidance documents:

» National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) (NEPC, 2013), specifically:

  – Schedule B5, Guideline on Ecological Risk Assessment; and

» ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines.

Whilst the NEPM is generally focused on assessment of risk to terrestrial ecological systems due to soil contamination, the guidance provided does provide a clear overview of the ERA process which is applicable to assessment of both terrestrial and aquatic ecosystems. The framework provided within the NEPM indicates that an ERA should consist of the following basic components.

» **Problem identification** – scoping phase to establish objectives and identify relevant data for the assessment (**Section 3**).

» **Receptor identification** – identifies species, communities and ecosystem processes that require protection and considers the level of protection that should be applied (**Section 5.4**).

» **Exposure assessment** – characterises the potential exposure pathways, exposure duration, exposure concentrations and intakes (**Section 5** and **Section 8.2**).

» **Toxicity assessment** – identification of appropriate toxicity values for the CoPC identified (**Sections 6.1** and **Section 8.3**).

» **Risk characterisation** – considers the calculated intakes relative to identified toxicity values to assess whether a risk may be posed to the identified receptors (**Section 8.4** and **Section 8.5**).

Figure 2 below illustrates the purpose and key activities associated with the ERA and how each of these tasks fits into the overall assessment of risks.

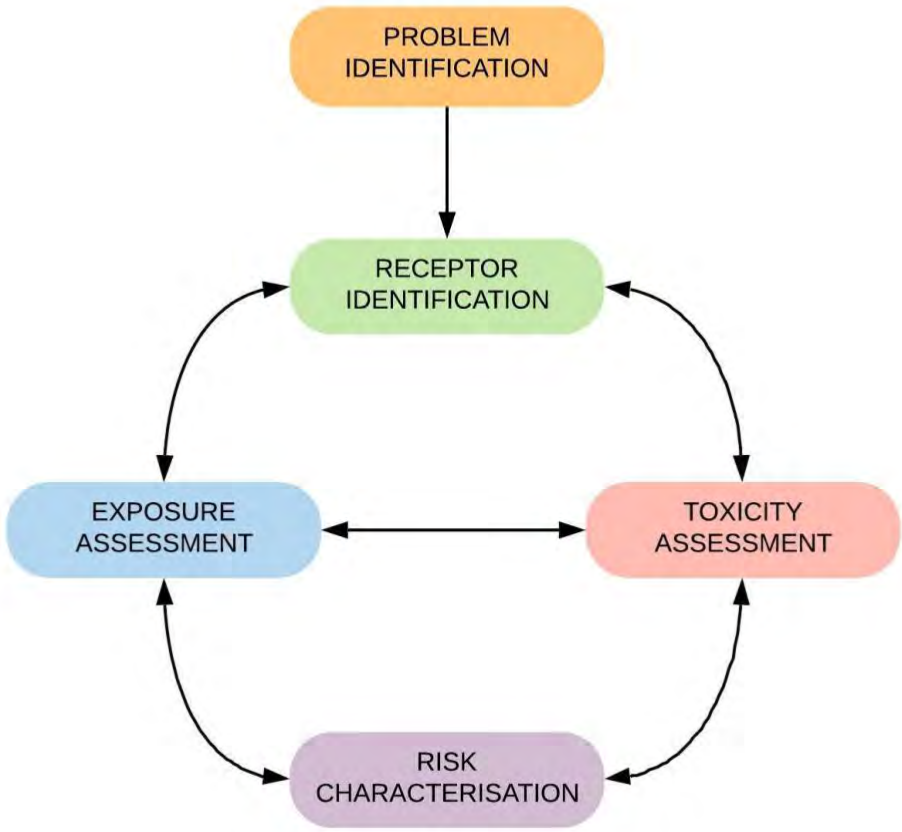

Figure 2: Ecological Risk Assessment Framework (source: ASC NEPM Schedule B5)

As defined in Schedule B5a (NEPC, 2013) both Preliminary and Definitive ERAs consist of the same five basic components of problem identification, receptor identification, toxicity assessment, exposure assessment and risk characterisation. A Preliminary ERA is generally conducted using conservative assumptions that favour protecting the environment. Thus, if a Preliminary ERA indicates the site faces a low risk from the contaminants, then there can be confidence that this is the case.

A Definitive ERA is required only in a situation where the concentration of the contaminant(s) is sufficiently high that it may pose a risk. A Definitive ERA requires greater data collection, uses more complex and environmentally realistic methods and reduces the uncertainty in the outcome of the ERA compared to the Preliminary ERA. As a result, Definitive ERAs are considerably more time-consuming and costly than Preliminary ERAs.

This ERA is not a Definitive ERA. Instead, the spatial extent and temporal variability of PFAS concentrations in soil and surface water will be reviewed. The aim of the review is to qualitatively assess whether pathways to ecological receptors are potentially active, and in turn assess the requirement for more detailed assessment and/or management. Where necessary, the ERA may identify whether there is insufficient data to complete the assessment for particular pathways and identify where additional data is required to clarify the exposures, or where potential risks can be adequately managed without the need for further data collection or assessment.

1.4 Scope of Works

The scope of work for the current HHERA is detailed in **Table 1**.

Table 1: HHERA scope of works

Item	Scope	Report Section
Issue/Problem Identification	This stage of the HHERA process involved a review of available information to identify the appropriate data for inclusion in the HHERA and any data gaps that may impact on the outcomes of the risk assessment. The HHERA has focused on areas where a complete source-pathway-receptor (SPR) linkage has been identified to potentially exist. SPR linkages identified to be incomplete or to result in low risks to identified receptors have not been further considered.	**Section 3**
Human Health Risk Assessment		
Exposure assessment	This stage of the human health risk assessment (HHRA) included: » Development of a HHRA CSM for the site. The CSM includes a description of the following: – The source(s), nature and extent of contamination. – Potential contaminant transport and/or migration pathways. – Potential human receptors that may be exposed to contaminants, and the complete and potentially significant pathways via which they may be exposed. » Identification of the expected frequency, extent and duration of exposures by human receptors via identified significant contaminant exposure pathways. » Identification and justification of relevant exposure parameters for receptors and exposure pathways considered in the HHRA. » Quantitative estimation of chemical intake concentrations for each receptor and exposure pathway. » The following receptors and exposure pathways have been considered in the HHRA: – School community receptors that are eating produce from the proposed expanded produce gardens and proposed chickens (eggs only). – Residential receptors that occupy properties directly adjacent to the site. Residential receptors have been assumed to be exposed via the following pathways: • Incidental ingestion of soil	**Section 5** and **Section 7**

Item	Scope	Report Section
	• Ingestion of home grown produce (fruits and vegetables only) – Recreational receptors that visit Tarro Recreational Area/Tarro Reserve. Recreational receptors have been assumed to be exposed via the following pathways: • Incidental ingestion of surface water during swimming.	
Toxicity Assessment (incorporating hazard identification and dose-response assessment)	This portion of the HHRA included: » Review of the potential hazards to human health associated with PFAS, based on review of toxicity profiles published by Australian or international regulatory agencies (e.g., National Health and Medical Research Council (NHMRC), World Health Organization (WHO), Agency for Toxic Substances and Disease Registry (ATSDR), United States Environmental Protection Agency (USEPA), etc.). Review of toxicological (dose-response) criteria for PFAS and identification of appropriate quantitative toxicity criteria for use in the HHRA.	**Section 6**
Risk Characterisation	This stage of the HHRA included: » Characterisation of the nature and potential incidence of adverse health effects to receptors based on comparison of estimated contaminant intake or exposures to relevant toxicity (dose-response) criteria. » Comparison of risk estimates with risk acceptance criteria recommended and/or adopted by state and federal regulatory agencies. » Discussion of the key uncertainties associated with the HHRA process and the assumptions and exposure modelling undertaken for the HHRA. » Consideration of the risk estimates in the context of identified uncertainties.	**Section 7.2**
Ecological Risk Assessment (ERA)		
Receptor identification	Review of publicly available literature to identify key ecological receptor groups for further consideration in the ERA.	**Section 5** and **Section 8**
Exposure assessment	It has been assumed that ecological receptors in Tarro Reserve may be exposed to PFAS via the following exposure pathways: » Direct contact with contaminants in soil (including uptake by plants). » Ingestion of contaminants in soil (soil invertebrates and grazing organisms).	**Section 5** and **Section 8**

Item	Scope	Report Section
	» Direct contact with and ingestion of contaminants in sediments and surface water in aquatic environments. » Ingestion of contaminants that may have bioaccumulated in aquatic biota	
Toxicity assessment	This stage has involved a review of the assumptions in the adopted screening criteria to determine their appropriateness for use in the current assessment.	**Section 6** and **Section 8.4**
Risk characterisation	Risks characterisation has been undertaken as follows: » Characterisation of the nature and potential incidence of adverse effects to receptors based on comparison of estimated contaminant exposures to relevant toxicity criteria. » Comparison of risk estimates with risk acceptance criteria recommended and/or adopted by state and federal regulatory agencies. » Where exceedances of screening criteria/toxicity values are identified, qualitative discussion of factors that may affect the toxicity of the compounds. Discussion of the key uncertainties associated with the ERA process and the assumptions adopted in the ERA.	**Section 8.5**

2. Site Identification

2.1 Site Details

The site is a primary school located approximately 160 kilometres (km) north of the CBD of Sydney and 20 km north west of the Newcastle CBD.

The investigation area is defined as the region in which sampling and analysis of various media was carried out to assess the nature and extent of PFAS contamination on-site. For the purposes of informing the HHERA and enabling assessment of risks to off-site receptors further sampling was undertaken in off-site areas.

Table 2: Site details

Property name	**Our Lady of Lourdes Primary School – Tarro**
Address	Anderson Drive, Tarro, NSW
Co-ordinates (Map Grid of Australia [MGA] Zone 56)	374835 E, 6369034 N (approximate centre of the investigation area)
Current property owners	Trustees of the Roman Catholic Church for the Diocese of Maitland and the Diocese of Maitland-Newcastle
Legal Identifier	Lots 21 and 22 of DP513106
Current property use	Primary School
Size	Approximately 4,300 square metres (m^2)
Local Government Area	Newcastle City Council
Zoning	Low Density Residential

The location of the site and the boundary of the DSI investigation area have been presented in **Figure F1** and **Figure F2**. The extent of sampling conducted in an expanded area to support the HHERA is shown in **Figure F3** through **Figure F5**.

2.2 Historical, Current, and Proposed Land Uses

Historically, the land at the rear of the Tarro Fire Station was separated from the school by a fence and was publicly accessible. Anecdotal reports from FRNSW indicate that the Tarro Fire Station used parts of the site for limited training/testing purposes, including the use of legacy AFFF products potentially containing PFAS. The exact period when legacy AFFF use would have occurred at the site is unknown; however; available information indicates it may have happened quarterly over several years. Tarro Fire Station was not a FRNSW training facility, and the use of legacy AFFF at the site is likely to have been associated with intermittent testing of firefighting equipment to ensure it was fit for use. An unknown quantity of legacy foam was used at the site and following training activities any excess of the legacy foam would have likely been hosed into the ground. Further information on the history of the site and surrounding area is provided in the DSI (Nation Partners 2019a) for the site.

The site is currently occupied by OLOL Primary School. Lot 21 comprises the northern half of the investigation area and includes a garden area with some fruit and vegetable planting in the northern portion and a hardstand playground area in the eastern portion. Two demountable school buildings were previously located in the northern portion of Lot 21 but were removed in January 2020. The produce garden was established in late 2018 and includes fruit and vegetables in raised beds and pots, along with several small fruit trees growing in the ground. The southern portion of Lot 21 is grassed open space.

The southern half of the investigation area, Lot 22 includes demountable school buildings

In the medium term (3-5 years), it is understood that the school plans to enhance the produce garden and have laying chickens on-site. There are also plans to refurbish play equipment and adjacent grounds.

2.3 Surrounding Land Uses

The land adjacent to the site is characterised by:

» North: Anderson Road, then residential properties followed by Tarro Reserve Fields and Tarro Reserve;

» East: The Tarro Fire Station and Eastern Avenue, followed residential properties and Tarro Public School;

» South: Northern Avenue, then residential properties; and

» West: School buildings and hardstand, then residential properties.

The surrounding land is characterised primarily by low density residential land use. Tarro Public School is located approximately 35 m to the east of the site (3 Eastern Avenue – separated by Eastern Avenue).

It is reasonably anticipated that the surrounding land uses around the site will remain similar for the foreseeable future.

2.4 Previous Investigations

The investigations undertaken to date at the site include:

» Nation Partners, 2019a. Detailed Site Investigation Report – PFAS Investigation (DSI). December 2019.

» Nation Partners, 2019b. Addendum 1 to Detailed Site Investigation Report – PFAS Investigation. December 2019.

Additional information collected since the DSI has been used to inform and refine the CSM and identify the key pathways for which further detailed assessment is required as part of this HHERA. The refinement of the CSM is discussed in **Section 5**.

The data collected in January and February 2020 is detailed in **Appendix A** and comprised:

On-site:

» 26 soil samples to further assess the presence of PFAS in shallow soils on-site.

» Two (2) filtration pit water and sediment samples to assess the presence of PFAS in water and sediment collected from the pits intended to filter stormwater before it enters the subsurface infiltration system present on-site.

- Resampling of three (3) on-site stormwater pits for surface water and sediment to confirm PFAS concentrations from previous sampling.
- Resampling of three (3) groundwater monitoring wells to confirm PFAS concentrations from previous sampling.

Off-site:

- 16 surface soil samples to assess the presence of PFAS in shallow off-site surface soil in the nature strips immediately adjacent to the site (running parallel to the north, east and south of the site).
- Eight (8) surface water samples to assess the presence of PFAS in stormwater and surface water downgradient of the site.
- One (1) sediment sample to assess the presence of PFAS in sediment at the main off-site stormwater discharge point.

All samples were analysed for an extended suite of 30 PFAS compounds. The sampling methodologies, results and QA/QC review of the data is provided in **Appendix A**.

3. Issues Identification

In accordance with enHealth (2012) and NEPC (2013) this stage of the HHERA has been undertaken to establish the context of the risk assessment and identify the key elements that need to be addressed through the HHERA process.

Figure 3 presents an overview of the outcomes of the issues identification process. Overall, the assessment process to date has identified a number of potentially sensitive receptors for which an assessment of risk has not been undertaken as part of the DSI process. It is therefore considered that a HHERA is an appropriate tool to enable a more detailed site-specific approach to evaluating risks for potentially exposed sensitive receptors.

3.1 Key Stakeholders

The key stakeholders relevant to the HHERA include:

- Employees and families within the OLOL Primary School community;
- Residents of properties immediately adjacent to the site;
- Users of Tarro Reserve;
- NSW State government and regulatory authorities;
- The site owner (Trustees of the Roman Catholic Church for the Diocese of Maitland and the Diocese of Maitland-Newcastle); and
- Fire and Rescue NSW.

3.2 Risk Management Decisions

It is not the role of the risk assessment to determine the most appropriate management options as risk management is a separate process. The outcomes of the HHERA will however inform the risk management decision process as it will identify:

- The key risk driving processes present at the site and how these processes contribute to the overall risk profile for the site and surrounding areas; and
- The data gaps, uncertainties and sensitivities inherent in the risk assessment process which will further inform the decision process with regard to the need for management and/or further investigation.

What are the issues associated with the existing environmental conditions at the site?

Investigations undertaken to date at the site have identified the presence of PFAS in environmental media at concentrations which have the potential to pose unacceptable risks to human and ecological receptors where source-pathway-receptor linkages are identified to be complete.

Why is risk assessment a necessary and/or appropriate option for the site?

The Tier 1 (and limited Tier 2) risk assessment undertaken as part of the DSI process for the site identified the potential for unacceptable risks under certain land use scenarios. It was identified that a quantitative HHERA would provide an appropriate mechanism via which to conduct a site-specific assessment of the potential for risks to human and ecological populations under both current and proposed future land uses on-site, and current land uses off-site.

What level of complexity is appropriate for the HHERA?

A range of quantitative and qualitative assessment tools are available as part of the HHERA process. However the most appropriate combination of tools should be selected based on site-specific information. For the current site there was considered to be an appropriate quantity of data to enable a quantitative assessment of risks to human receptors on and off-site. However, the nature of the ecological habitat present at the site and in nearby areas as well as the available environmental data suggested that a more high level qualitative approach (in line with a Preliminary ERA as defined in the ASC NEPM) to the ecological risk assessment component was appropriate.

What susceptible or vulnerable populations are likely to be exposed to environmental impacts?

The key vulnerable populations identified during the DSI process, and for which a HHERA was considered an appropriate method of further assessment are:

- Off-Site residents that occupy properties directly adjacent the site;
- Recreational receptors that utilise the nearby recreational reserve; and
- Members of the school community (children, teachers and parents) that may consume produce that is grown within the investigation area.

What exposure pathways should be considered?

The primary exposure route for the contaminants of potential concern identified during the DSI process (PFAS) is ingestion as these substances are large and do not easily cross the skin. PFAS are also not volatile in the chemical forms found at the site therefore inhalation is not considered a significant pathway.

What outcomes is the HHERA intended to inform?

The outcomes of the HHERA will inform remediation, management and ongoing monitoring plans for the site and surrounding impacted areas. The HHERA will identify the key risk driving pathways which will assist the key stakeholders in deciding which remediation and management options will result in the greatest beneficial impact to receptors.

How urgently are risk outcomes and management measures needed at the site?

The key stakeholders for the site include teachers and parents responsible for the wellbeing of young children. It is therefore important that the HHERA process is both thorough and based on best practice approaches but also that it is undertaken within an accelerated timeframe to provide regluar updates for these stakeholders to ensure that their needs are met and mitigation measures are implemented as soon as practicable where they are identified to be needed.

Figure 3: Issues Identification Summary

4. Data Evaluation

4.1 Data Used in the Risk Assessment

In preparing the current HHERA, Nation Partners has relied upon the data and information presented in the following documents:

» Nation Partners, 2019a. Detailed Site Investigation Report – PFAS Investigation (DSI). December 2019.

» Nation Partners, 2019b. Addendum 1 to Detailed Site Investigation Report – PFAS Investigation. December 2019.

For full details of the objectives of these reports, the available data, and the assessment of data quality, reference should be made to the above mentioned reports and Addendum 2 to Detailed Site Investigation Report – PFAS Investigation provided in **Appendix A**.

In addition to the analytical data, a water use survey was completed by residents of the surrounding area to assess water and land use (**Section 4.2**).

Information from the above listed reports considered relevant to the site environmental setting has been summarised in the CSM presented in **Section 5**. Sample locations included in the above listed reports have been shown in **Figure F3** through **Figure F5**.

4.2 Water use survey

A water use survey was prepared to investigate water supply and patterns of use at private properties outside of the DSI investigation area. The water use survey aimed to provide information on the potential use of bore and surface water on private properties in the vicinity of the site, particularly down gradient. The residents surrounding the site on Anderson Drive, Eastern Avenue, and Northern Avenue were door knocked on 18 February 2020 and the water use survey was available for completion by contacting the project hotline.

Three (3) surveys were completed by residents. All participants reported they used town water for drinking, cooking, showering, and irrigation. In addition, all participants reported that they do not abstract groundwater for any purpose on their property. Some participants indicated they grew their own produce on site, however they reported that their produce was watered with town water with irrigation occasionally being supplemented with tank (rain) water. Only one participant was identified to keep chickens on their property for the purpose of collecting and consuming eggs, all other participants were not identified to keep chickens.

Participants indicated they fished recreationally in Port Stephens. No participant reported that they swam in local surface water bodies.

A further two (2) residents did not wish to fill out the survey but did verbally indicate that they only used town water and did not have tanks or bores at their property. Similar anecdotal responses in relation to a lack of bore water usage were provided by members of the school and local community during engagement activities as part of the DSI.

4.3 Data Quantity

Samples of soil, surface water, sediment and biota were collected during the investigations listed in **Section 4.1** and **Appendix A**. The location and number of samples is presented in **Table 3**.

The data obtained from these samples is considered to be sufficient to enable a reasonable estimation of potential exposure to identified receptors within the HHERA. In addition, the data has been collected is considered to provide suitable spatial coverage of potential exposure areas to inform risk outcomes and risk management decisions.

It is noted that the surface water samples collected from on-site (SW1, SW2 and SW5) were from within stormwater pits where the water had accumulated following rainfall events. The first time these locations were sampled, was during an extended dry period where water had been present in the pits for an unknown period of time. The second round of sampling at these locations was conducted was during wet conditions to obtain data that was more representative of stormwater concentrations during rainfall events.

Table 3: Summary of Data Quantity

Matrix Type	Number of Sample Locations	Number of Samples (a)
On-site		
Soil (all depths)	38	81
Soil (0.0 – 0.4 m bgl)	35	48
Sediment	4	4
Groundwater	2	4
Surface Water/Stormwater	6	8
Off-site		
Soil (0.0-0.2 m bgl) (b)	16	16
Surface Water	8	10
Groundwater	1	2

(a) It is noted that multiple samples have been collected from some sample locations to provide additional temporal or spatial data (e.g. samples collected across the sub-surface profile, or resampling groundwater monitoring wells).

(b) Off-site soil samples were collected from a maximum depth of 0.2 m bgl as site-derived soil impacts are considered to be present as a result of surface run-off and wind dispersion mechanisms only. There was no identified source of contamination in deeper soils off-site (other than leaching from surface soils and percolation of rainwater through the soil profile which is not considered likely to result in increased soil concentrations at depth).

4.4 Data Quality

The analytical data collected during the investigations conducted at the site was reviewed during the investigation reporting phase to evaluate whether the data were in compliance with the data quality indicators (DQIs) set prior to commencement of the works. The data assessment (or validation) process included checking of analytical procedure compliance and an assessment of the accuracy and precision of the analytical data from a range of quality control measurements generated from both the sampling and analytical programs.

The details and outcomes of the data validation process has been incorporated into each of the reports listed in **Section 4.1** and thus have not been further detailed in the current HHERA. Review of the data validation outcomes did not identify any significant issues that may impact on the overall precision and accuracy of the primary data set. Therefore, the analytical results obtained from investigations conducted at the site to date were considered to be valid and representative of concentrations of the analysed compounds at the sample locations tested. The data was thus considered to be suitable for use in the assessment of exposure risks to identified receptor populations both on and surrounding the site.

4.5 Data Limitations

The available data for environmental media is considered adequate to characterise the nature and extent of PFAS contamination at the site and in the area surrounding the site, and to enable assessment of potential health or ecological risks. However, it is noted that data limitations which have potential to impact on the outcomes of the HHERA have been identified based on review of the available data from previous investigations. These are summarised in **Table 4** below, along with a description of the method used to address these data limitations in the HHERA.

The identified data limitations may result in a marginal increase in uncertainty, however, the overall conclusions reached in this HHERA are considered unlikely to be significantly impacted due to:

» A number of conservative exposure parameters have been adopted in the exposure modelling for human health risks to account for data limitations (e.g. assuming 10% of fruits and vegetables consumed are derived from home grown produce as per the ASC NEPM; exposures throughout the entire exposure duration are to the maximum reported PFAS concentrations in environmental media sampled etc.).

» Theoretical modelling of plant and chicken egg uptakes has been adopted, and has been validated against available data, to estimate exposure through home grown produce pathways.

» Qualitative approaches have been adopted in the ERA portion of this report to enable consideration of ecological risks in the absence of analytical data.

Table 4: Summary of Data Limitations

Data Limitation	Potential Significance	Manner in Which Addressed in the HHERA
Limited number of biota samples – fruit and vegetable samples from on and off-site locations have been limited to date.	Low (fruits and vegetables) – given the low reported soil concentrations in surficial soils on-site and off-site and the results of the water use survey which suggests that groundwater is not extracted for irrigation purposes in the area, it is considered unlikely that home grown fruit and vegetable produce is a significant source of PFAS exposure. High (chicken eggs) – literature chicken egg uptake factors indicate that where there is PFAS in soils there is potential for uptake into chicken eggs at concentrations which may result in exposures above the recommended daily PFAS intakes.	Plant and egg concentration/uptake factors have been used to estimate PFAS concentrations in home grown produce. Estimated concentrations have been validated against the produce sample results (fruits and vegetables only) collected to ensure appropriate exposure concentrations are considered. Uptake values for chicken eggs have been adopted from published data for a study conducted to assess PFAS uptake into domestic chickens (eggs) as a result of PFAS exposure in water. In the absence of site-specific information, and due to a lack of data relating to PFAS uptake as a result of exposure to PFAS in soil, this

Data Limitation	Potential Significance	Manner in Which Addressed in the HHERA
		published data is considered appropriate to provide an indication of potential chicken egg concentrations under future land use conditions.
No aquatic biota samples collected from the waterway within Tarro Reserve.	Low – the water use survey did not identify local residents that collect aquatic organisms for consumption purposes from the waterway within Tarro Reserve. In addition, given the highly modified nature of this waterway it is considered unlikely to be a significant food source for local wildlife.	It has been assumed that local residents and recreational users of Tarro Reserve do not consume aquatic biota collected from this area. Further assessment of potential for risks to ecological receptors has been qualitatively considered in the HHERA.
Limited number of off-site soil samples	Low – the nature of the historical use of fire fighting foams which contained PFAS is such that the highest concentrations of PFAS are likely to be found in the primary training area (on-site) with diffuse low level concentrations present in the surrounding area. This assumption is supported by the data collected to date, and therefore indicates that the sampling conducted to date is appropriate for assessing risks and implementing management measures.	Exposure estimates have been based on the highest reported soil concentrations collected from off-site areas, including soils collected directly outside the boundary fence of the site.

4.6 Selection of Contaminants of Potential Concern

AFFF products containing primarily PFOS, PFHxS and other perfluoroalkane sulfonic acids (PFSAs), with lesser components of Perfluoroalkane Carboxylic Acids (PFCAs, including PFOA) and fluorotelomers such as 6:2 Fluorotelomer sulfonic acid (6:2 FTSA), were historically used by FRNSW.

Whilst PFOS, PFHxS, and PFOA are the most commonly tested and reported compounds, these are only three of a wide range of PFAS which are potentially present in AFFF. While regulatory investigation levels are not available for the additional PFAS compounds present in AFFF, they are still being considered as CoPC. As such, an analytical suite comprising 30 PFAS compounds was selected for the previous investigations (refer to **Section 2.4**).

An evaluation of the most prevalent PFAS compounds within environmental media at the site and in off-site areas identified that PFOS, PFOA, PFHxS, PFHxA, PFPeA and PFBS were most commonly present (refer to **Figure 4** through **Figure 7**.

To enable an evaluation of risks based on as many of the PFAS compounds present as possible, a literature search was conducted to evaluate whether toxicity values are available for PFAS other than PFOS, PFOA and PFHxS. Toxicity values were identified for PFHxA, therefore it was determined that it would be included in the HHRA. The CoPC for this report are PFOS, PFOA, PFHxS, and PFHxA. Using these CoPCs as indicators of overall risk is considered appropriate as:

» Guidance Statements issued by enHealth (2016) state the PFAS of most concern are PFOS, PFOA, and PFHxS;

» While other PFAS compounds were detected in the previous investigations, reported concentrations are generally much lower (e.g. orders of magnitude below) the measured concentrations of PFOS, PFHxS and PFOA (refer to results presented in the attached **Table T1** through **Table T3**);

» Screening criteria that have been adopted to be protective of human health and the environment are available for PFOS, PFHxS and PFOA but no other PFAS compounds; and

» A margin of safety approach will be adopted to provide an indication of the potential for cumulative exposure to multiple PFAS to result in unacceptable risks.

Overall the data indicate that assessment of these four major PFAS compounds (PFOS, PFOA, PFHxS, and PFHxA) will provide an adequate indication of potential risks to identified receptors.

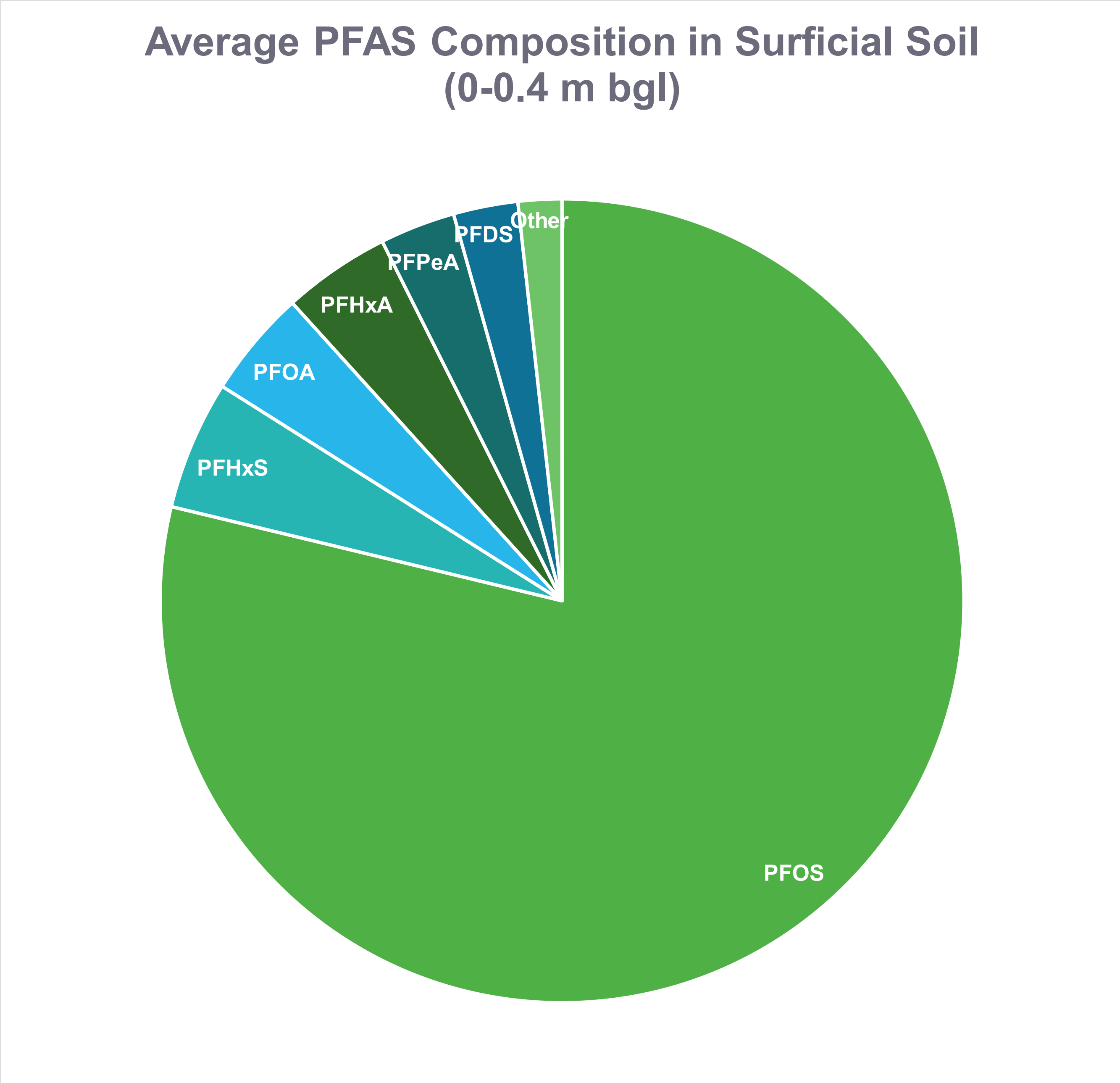

Figure 4: PFAS in on-site soil

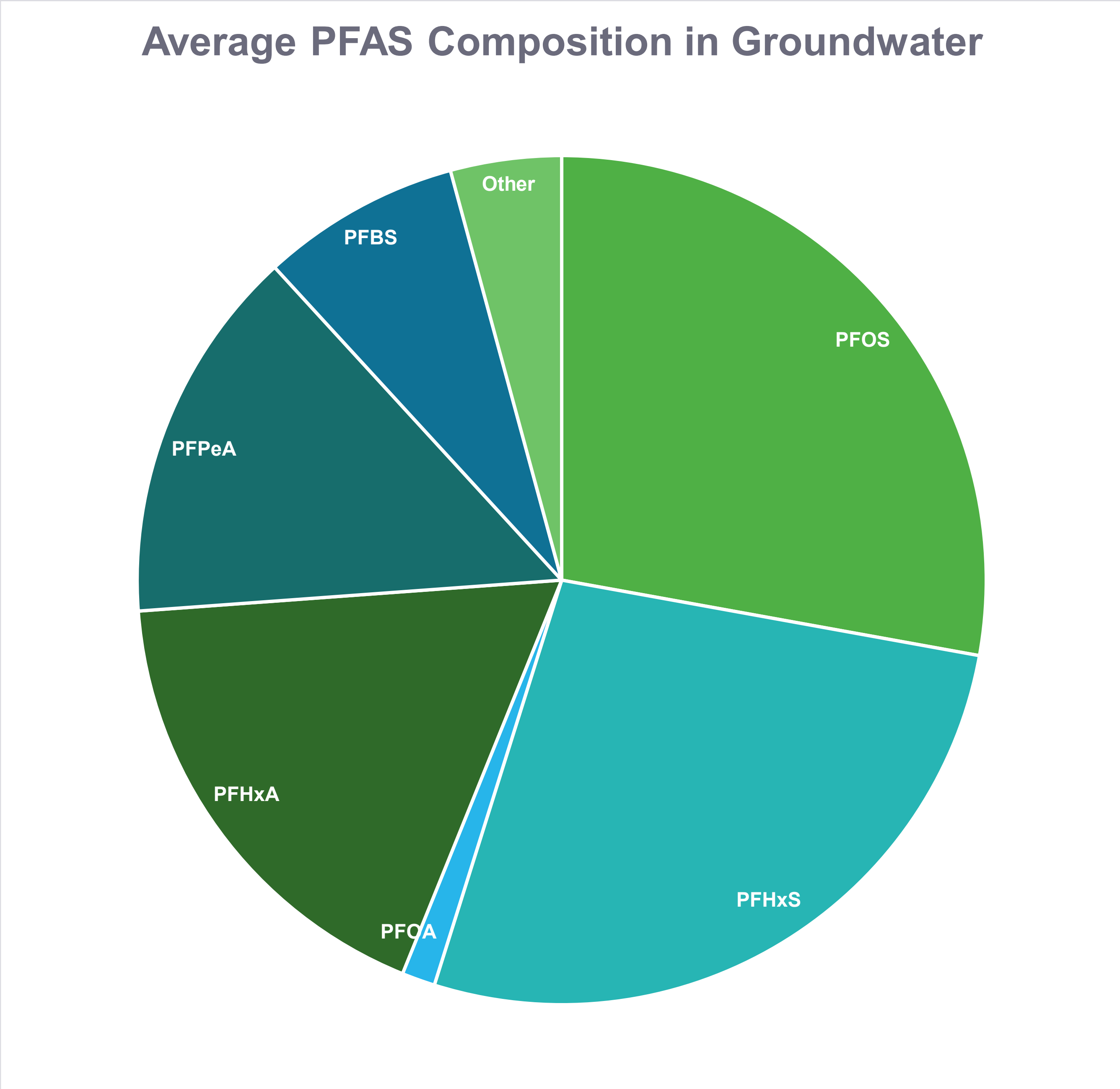

Figure 5: PFAS in on-site groundwater

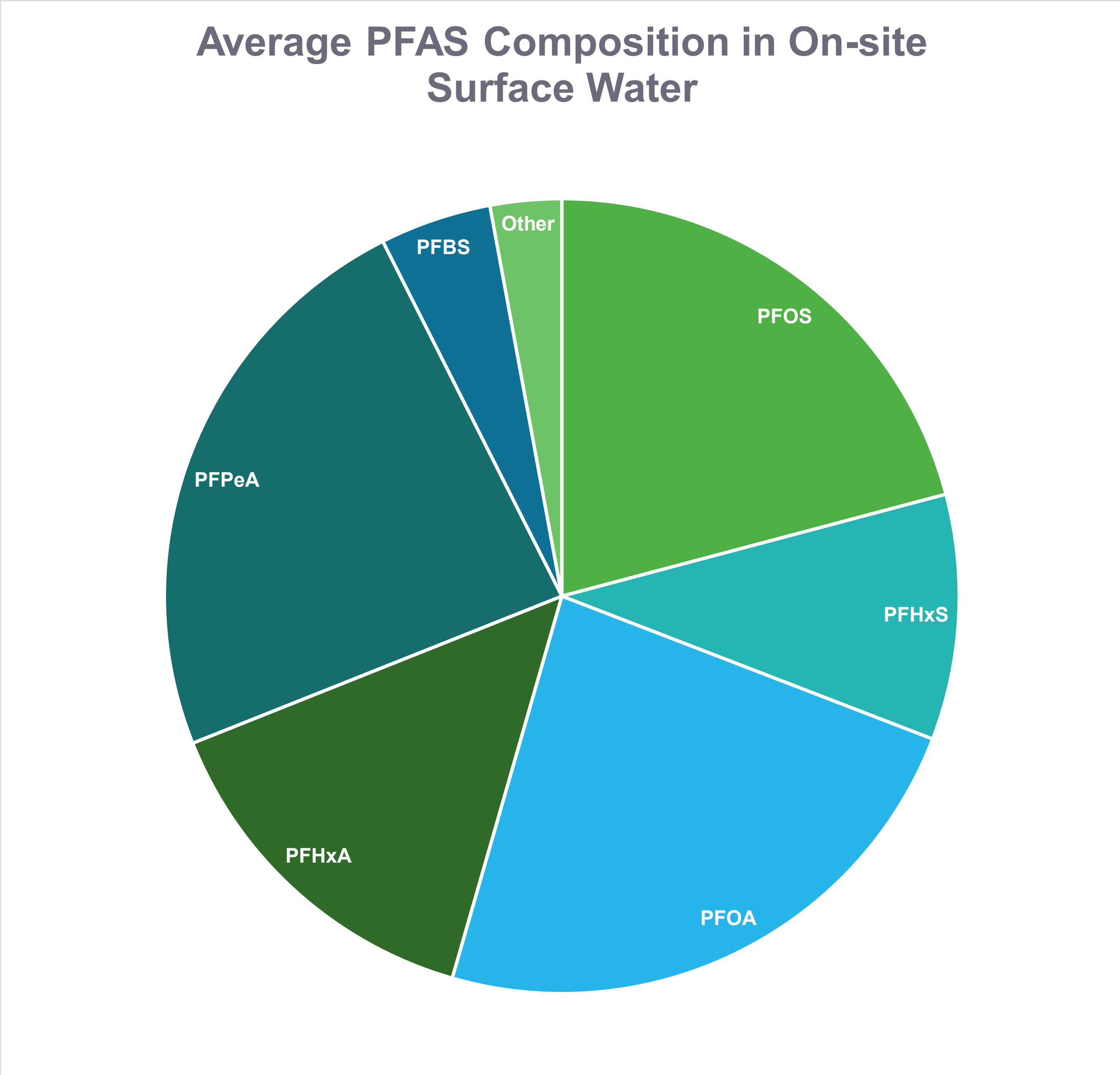

Figure 6: PFAS in on-site surface water

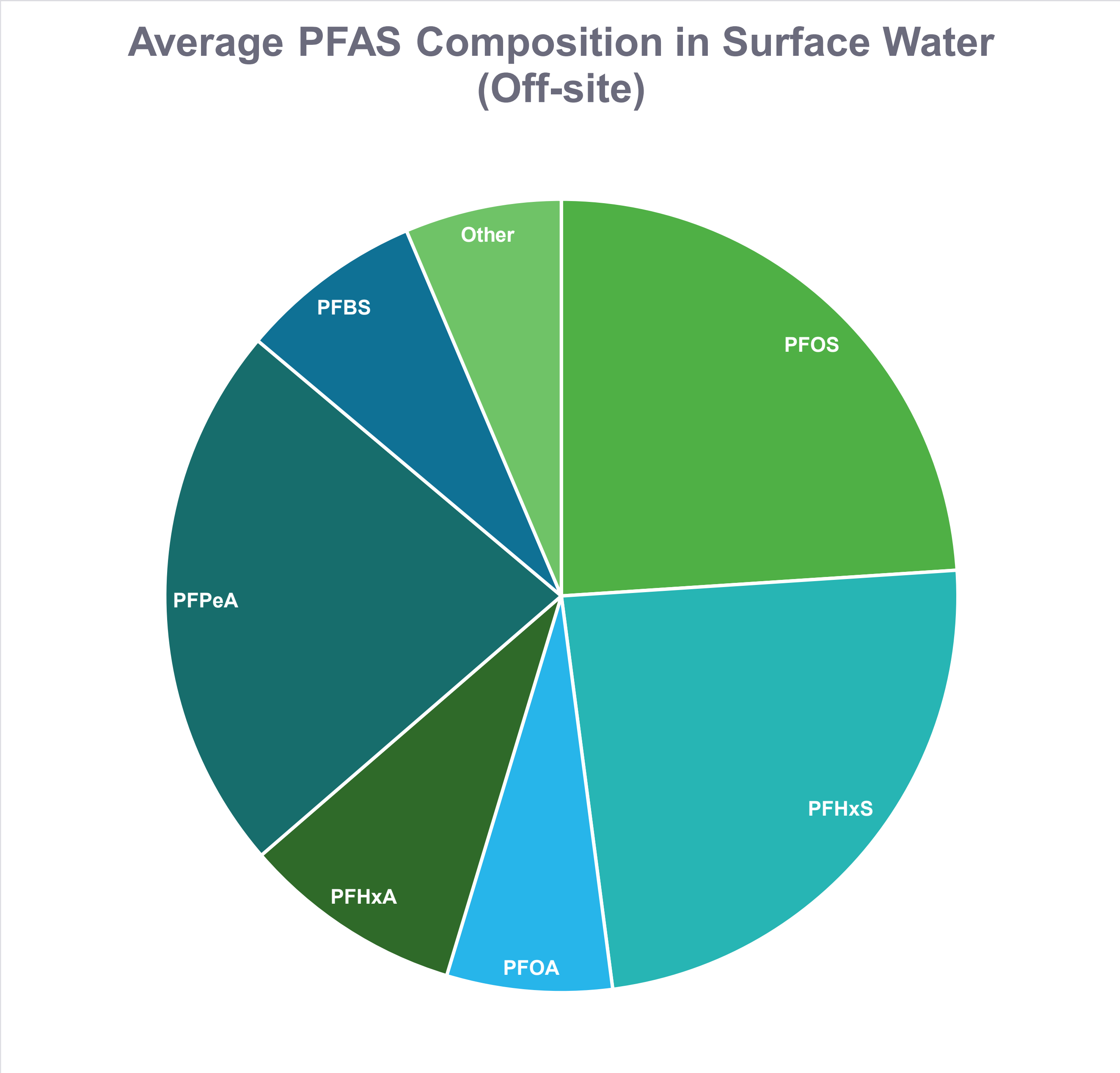

Figure 7: PFAS in off-site surface water

5. Conceptual Site Model

5.1 Environmental Setting

5.1.1 Topography and Hydrology

The site is relatively flat with an elevation that ranges from approximately 7.5-10 m Australian Height Datum (AHD). It exists on the northern side of a shallow ridge which gently slopes to the north and east. Surface water drainage follows the topography to the north east, towards the infiltration unit present in the north-eastern corner of the site. The overflow from this unit enters the local stormwater system on Anderson Drive and is expected to discharge to the north towards Tarro Reserve and waterbodies north of the reserve. This area discharges to the Hunter River (approximately 2 km to the east of the site) via Purgatory Creek (approximately 800 m to the east of the site).

5.1.2 Soils, Geology and Hydrogeology

The site's regional geological unit is the Tomago Coal Measures, which are described as Siltstone, sandstone, coal, tuff, claystone, conglomerate and minor clay. The on-site soil measures are described as Beresfield residual soils.

A previous geotechnical report for the school (Coffey [2007], *Proposed Additions - Our Lady Of Lourdes Primary School, Tarro, Geotechnical Assessment*) was reviewed and included four boreholes approximately 30-50 m west of the site. Soils generally encountered were:

» FILL (topsoil), comprising clayey silt, from the surface to 0.1-0.2 metres below ground level (mbgl);

» Sandy grading to silty CLAY from 0.1-1.5 mbgl; and

» Extremely weathered SILTSTONE, excavated as a silty clay, from 1.5-2.2 mbgl (the termination depth of boreholes).

The hydrogeology on-site, according to regional plans in Lotsearch (2019) (the Lotsearch report is presented in the DSI (Nation Partners, 2019a) is characterised by fractured or fissured extensive aquifers of low to moderate productivity.

Soils encountered during the DSI were generally consistent across the investigation area and were similar to those described in the previous geotechnical investigation. Deeper boreholes for the three monitoring wells were completed using a solid flight auger with tungsten-carbide bit and encountered grey/brown weathered siltstone/shale until completion depths at 7-8 mbgl. Minor water ingress (increased moisture in cuttings) was observed during drilling of each well, typically at a depth of approximately 6.5 mbgl in weathered rock. The standing water level (SWL) in each well was higher than the depth of water strike, indicating a confined or semi-confined aquifer.

The calculated groundwater flow direction was north to north-north-east (towards Tarro Reserve), at a gradient (i) of 0.03.

5.1.3 Registered Groundwater Bores

A review of Lotsearch 2019 identified the closest registered bores to the site are:

Well ID	Use	Depth (m)	Standing Water Level (m)	Distance from the site
GW201549	Monitoring	3.1	-	1253 m south east
GW202428	Monitoring	4.0	1.2	1919 m south east

Further review of the Australian Groundwater Explorer[1] indicates that the bores to the south east are nearer to the Hunter River at an elevation approximately 5-8 m lower than the site and are screened in alluvial soils. Additional monitoring bores are located approximately 2.2 km west of the site at an elevation approximately 5 m higher and are generally 12-15 m deep and screened in sandstone/siltstone.

The Catholic Diocese advised that there are no known groundwater bores installed at the school. No existing groundwater bores were observed during the previous investigations. In addition, a water use survey of residents surrounding the site did not reveal the use of groundwater bores in the immediate vicinity of the site (**Section 4.2**).

5.1.4 Sensitive Receptors

To the north of Tarro Reserve, approximately 205 m north of the site, is a freshwater waterbody that is used primarily as a stormwater retention facility where stormwater from the area discharges during storm events. Based on historical aerial photography this lake was constructed between 1984 and 1991 when surrounding low-lying areas were filled to create the Tarro Reserve sporting fields.

Further north, beyond the railway line and connected to the Tarro Reserve retention lake by a culvert, is a freshwater wetland area (referred to as 'Tarro Swamp' on the 2015 topographic map in Lotsearch [2019]). It is located approximately 500 m north (downgradient) of the site. Data from the Lower Hunter and Central Coast Regional Vegetation Survey in Lotsearch (2019) describes the area as a Freshwater Wetland Complex. Based on field observations over the course of the DSI and historical aerial photographs, Tarro Swamp is an ephemeral waterbody and is traversed by a number of roads/tracks and fences.

Lotsearch (2019) also indicates that the wetland is a high potential aquatic groundwater dependent ecosystem (GDE) and has a high likelihood as an inflow dependent ecosystem (IDE).

The wetland area is expected to drain to Purgatory Creek, located approximately 800 m east of the site, which then discharges to the Hunter River approximately 2 km east of the site.

5.2 Nature and Extent of Contamination

The findings of PFAS investigations completed by Nation Partners since 2019, and upon which the HHERA has relied, are summarised in **Section 5.2.1** to **Section 5.2.5** below.

5.2.1 Soil

On-site

Concentrations of PFAS exceeding the human health screening values for residential use with gardens/ accessible soil were reported in 64 of the 81 samples analysed. This screening value was used as a conservative measure for initial screening purposes given the site use as a primary school. This land use scenario assumes, among other things, the consumption of 10% of a person's fruit and vegetable intake

[1] http://www.bom.gov.au/water/groundwater/explorer/map.shtml

comes from produce grown in the site's soil. The minor produce grown and consumed at OLOL Primary School would not constitute 10% of dietary intake. In addition, produce grown at OLOL, with the exception of several small citrus trees, is in pots or planters using imported soil. One sample of soil from a large planter box that was located on the ground was collected and analysed for PFAS. Concentrations were below the laboratory limit of reporting.

A total of 14 exceedances of the human health screening value for public open space were reported which are considered to be more applicable to the way the land is used at the school.

Due to the exceedances of the human health screening values for PFAS in soils, a preliminary risk assessment was undertaken. The site-specific assessment indicated that risks associated with exposure to PFAS, via incidental ingestion of soils, were considered to be low and acceptable (i.e. PFAS intakes are likely to be less than the Tolerable Daily Intake recommended by Food Standards Australia New Zealand) for exposures to both surface (<0.2 mbgl) and near surface (<0.4 mbgl) soils at the site.

Eight soil samples exceeded the interim ecological direct exposure criterion for PFAS.

Off-site

Concentrations of PFAS exceeding the human health screening values for residential use with gardens/ accessible soil were reported in 9 of the 16 nature strip soil samples analysed. This screening value was used as a conservative measure for initial screening purposes given the residential context of the surrounding land uses to the site.

Public open space is a more appropriate screening criteria for nature strip areas, regardless of the surrounding land use context. No exceedances of the human health screening value for public open space were reported.

The interim ecological indirect exposure criterion for PFAS was exceeded in 9 of the 16 nature strip soil samples analysed. There were no exceedances of the ecological direct exposure criterion for PFAS.

5.2.2 Groundwater

Groundwater was encountered beneath the site at a depth of approximately 6 m. Concentrations of PFAS were detected in groundwater down gradient of the likely area of AFFF use. PFAS concentrations in groundwater up gradient of the likely AFFF use area were less than the laboratory limit of reporting.

An exceedance of the drinking water quality screening value was reported from one groundwater monitoring well at the downgradient boundary of the site. No exceedances of the recreational water quality criterion were reported. As groundwater is not consumed or used at OLOL Primary School, PFAS in groundwater at the site is not considered to pose a direct risk of elevated exposure to the school community.

The concentration of PFAS in the same downgradient monitoring well exceeded the PFAS ecological freshwater protection screening levels.

These screening value exceedances were replicated in the second round of groundwater sampling undertaken in February 2020, though lower concentrations of PFAS were reported.

5.2.3 Surface Water

On-site

Concentrations of PFAS exceeding the drinking water and recreational water quality screening values were detected in one of two samples of surface water collected from the OLOL Primary School stormwater system in October 2019. As surface water is not utilised for drinking at the site or local area, and access to stormwater is limited as it is contained within a subsurface drainage system, PFAS in surface water at the site is not considered to pose a direct risk of elevated exposure to the school community.

The concentration of PFAS in surface water also exceeded the PFAS ecological freshwater protection screening levels.

The two stormwater system locations were resampled in January 2020, along with one additional location. PFAS concentrations were lower than in 2019, with all results below the recreational water quality screening value.

A sample collected from one rainwater tank reported no detectable concentrations of PFOS, PFHxS and PFOA (all results were below the laboratory reporting limit).

Off-site

Concentrations of PFAS exceeding the drinking water quality screening values were detected in four (4) of the 10 samples of surface water collected in off-site surface water.

No exceedances of the health-based guidance value for recreational water were reported.

The concentration of PFAS in surface water also exceeded the PFAS ecological freshwater protection screening levels where:

» Two (2) of the 10 surface water results exceeded the screening criterion for freshwater 95% species protection level for PFOS, and

» The 10 surface water results exceeded the screening criterion for freshwater 99% species protection level for PFOS. It should be noted that any results above the laboratory limit of reporting [LOR] were considered to exceed the freshwater 99% species protection level.

Samples collected from an off-site rainwater tank and pond reported no detectable concentrations of PFOS, PFHxS and PFOA (all results were below the laboratory reporting limit).

5.2.4 Biota

Samples collected from five on-site homegrown produce samples reported no detectable concentrations of PFOS, PFHxS and PFOA (all results were below the laboratory reporting limit). Concentrations of PFOS, PFHxS and PFOA were below the relevant screening levels in the produce samples. This indicated that the consumption of edible produce currently grown in the current garden area at the site was not an active pathway for exposure to PFAS.

5.2.5 Groundwater – Surface water interactions

In this HHERA, potential risks to both human and ecological receptors contacting surface water bodies are assessed through consideration of concentrations at the point of exposure (i.e. in surface water). In this context, concentrations in groundwater are not considered directly relevant to the assessment of risks to these receptors. However, it remains important for the purposes of developing a conceptual site model to understand the extent of groundwater – surface water interactions, and on this basis to assess whether the identified PFAS concentrations in groundwater may act as a contributing source to surface water.

Shallow groundwater and surface water potentially interact in some areas surrounding the site, i.e. Tarro Swamp/Tarro Wetland Reserve. As discussed in the DSI (Nation Partners, 2019) this source – receptor – pathway (SPR) linkage is considered unlikely given the PFAS concentrations reported in groundwater at the downgradient site boundary, the hydrogeological conditions encountered on-site (low yields and likely low conductivity of the shale aquifer and measured slight groundwater gradient), and the distance to this receptor (250 m – not considered a long distance for PFAS migration in water, but considered substantial in the context of the local hydrogeological conditions).

While this has not been quantified, sampling of drains and waterways downgradient of the site has been undertaken and indicates that surface water is the primary migration pathway. As such, the potential influence of groundwater and surface water interactions on the quality of surface water is considered to have been assessed, with the surface water quality reported in the DSI a function of surface runoff (primary migration pathway) and groundwater discharges (if any).

5.3 Contaminant Transport Mechanisms

Potential transport mechanisms via which CoPC may migrate within and from the site are summarised in **Table 5**.

Table 5: Potential Contaminant Transport Mechanisms

Transport Mechanism	Comment	Likelihood or Significance
Wind erosion and atmospheric dispersion of surficial soils	PFAS has been reported to be present in surficial soil samples collected from across the DSI investigation area and from nearby nature strips.	Potential – it is unclear what transport mechanism (potentially spray drift during training exercises, or overland flow of stormwater) has resulted in the presence of PFAS in surficial soils along the adjacent nature strips, however given the unsealed nature of the site, there is potential for wind erosion to occur.
Volatilisation and vapour migration	The PFAS reported to be present at the site are not considered to be volatile in nature.	Unlikely – the CoPC identified for the site are not considered to be volatile, therefore it is considered unlikely that contamination present at the site is present in the vapour phase.
Leaching from soil to groundwater and transport in groundwater	Historical fire training at the site is understood to have been conducted on unsealed areas of the site. PFAS has been reported to be present in groundwater sampled from beneath the site.	Likely – the presence of PFAS in groundwater beneath the site and the unsealed nature of the site indicates that PFAS present in soils may have leached into rainwater and been transported to the groundwater table as it percolated through the sub-surface profile.
Discharge of impacted groundwater to nearby surface water bodies	Groundwater has been reported to contain PFAS beneath the site.	Potential – the presence of PFAS in groundwater and the distance to the nearest water body (~250 m) is such that there is potential for impacts in groundwater to be discharging to surface water.
Leaching from surficial soils to surface run-off and discharge to nearby waterways	PFAS has been detected in surface water sampled from along the stormwater drainage channels leading from the site to Tarro Reserve wetland. Surface water sampled from the Tarro Reserve wetland was also reported to contain PFAS.	Likely – reported PFAS in surface water samples indicates that PFAS is leaching from soils at the site into surface run-off and entering the stormwater system. It has been identified that the stormwater system for the site is connected to the Tarro Reserve lake and the Tarro Swamp wetland.
Accumulation of PFAS in biota that inhabit Tarro Reserve wetland	A number of PFAS compounds reported to be present in environmental media are known to be bioaccumulative.	Likely – the reported presence of PFAS in surface water within Tarro Reserve wetland indicates that there is potential for bioaccumulation to be occurring.

5.4 Receptors

Based on the current land use at the site and in the surrounding area, the following receptors are considered to have the potential to be exposed to site-derived PFAS impacts:

» Adults and children that work at or attend OLOL Primary School;

» Residents (adults and children) that live on properties adjacent to the site;

» Recreational receptors that use Tarro Reserve for recreational activities; and

» Ecological receptors that inhabit or forage within Tarro Reserve.

5.5 Potential Exposure Pathways

In order for a human receptor to be exposed to a chemical contaminant deriving from a site, a complete exposure pathway must exist. An exposure pathway describes the course a chemical or physical agent takes from the source to the exposed individual and generally includes the following elements (USEPA,1989; NEPC, 2013):

» A source and mechanism of chemical release;

» A retention or transport medium (or media where chemicals are transferred between media);

» A point of potential human contact with the contaminated media; and

» An exposure route (e.g. inhalation) at the point of exposure.

Where one or more of the above elements is missing, the exposure pathway is considered to be incomplete and there is therefore no risk to the receptor.

Exposure pathways that have been considered to be complete for identified on-site and off-site receptors have been summarised in **Table 6** below.

Table 6: Summary of Exposure Pathways Considered in the HHERA

Exposure Pathway	Complete (Yes/No)	Comments
Adults and children that work at or attend OLOL Primary School		
Dermal contact with impacts in environmental media (soil, water)	No	PFAS are not readily absorbed via the dermal exposure pathway and therefore this pathway is not considered to be complete at the site.
Incidental ingestion of soil and Inhalation of dust generated from on-site soils	Yes	The DSI identified that exposure to PFAS impacts in soil as a result of incidental ingestion and dust inhalation for adults and children is low and acceptable, however for the purpose of understanding the cumulative exposures to all exposure pathways on-site this exposure pathway has been considered to be complete for these receptors.
Incidental ingestion of groundwater	No	No groundwater extraction is occurring on the site therefore this exposure pathway is not considered to be complete at the site.
Incidental ingestion of surface water and sediments	No	There are no natural waterways present on-site and stormwater is managed through a sub-surface drainage system which limits access to pooled stormwater.

Exposure Pathway	Complete (Yes/No)	Comments
		Therefore, this exposure pathway was not considered to be complete at the site.
Future Exposure Pathway – Ingestion of home grown produce	Yes	OLOL have indicated that there is a potential for additional garden beds to be constructed at the site for the purpose of growing fruits and vegetables for human consumption. This future exposure pathway has been assessed to inform the design process.
Future Exposure Pathway – ingestion of chicken eggs collected from the site	Yes	OLOL have indicated that there is a potential for chickens to be housed at the site for the purpose of collecting eggs for human consumption. This exposure pathway has been assessed to inform the decision process with regard to chickens at the site.
Residents (adults and children) that live on properties adjacent to the site		
Dermal contact with impacts in environmental media (soil, water)	No	PFAS are not readily absorbed via the dermal exposure pathway and therefore this pathway is not considered to be complete for these receptors.
Incidental ingestion of soil and Inhalation of dust generated from on-site soils	Yes	Sampling of surface soils along the nature strip indicates that there is potential for PFAS to be present in surface soils in residential properties. Although the reported concentrations are below public open space screening criteria, this exposure pathway has been considered to enable assessment of cumulative exposures from multiple exposure pathways.
Incidental ingestion of groundwater	No	A water use survey conducted for nearby residents did not identify any residents that were utilising groundwater for extractive purposes.
Incidental ingestion of surface water and sediments	No	As noted above, the stormwater from the site is managed via a sub-surface drainage system which discharges directly into the enclosed local stormwater system. This system flows into open drainage channels within Tarro Reserve.
Ingestion of home grown produce (fruits and vegetables)	Yes	During the water use survey some participants indicated that they grow fruits and vegetables in their gardens. Due to the limited nature of off-site soil samples this exposure pathway has been assessed to evaluate the potential for risks to these receptors.
Ingestion of chicken eggs from chickens kept in residential gardens	No	This exposure pathway was not identified to be complete for off-site residents near the site under current land use conditions.
Recreational receptors that use Tarro Reserve for recreational activities		
Dermal contact with impacts in environmental media (soil, water)	No	PFAS are not readily absorbed via the dermal exposure pathway and therefore this pathway is not considered to be complete for these receptors.

Exposure Pathway	Complete (Yes/No)	Comments
Incidental ingestion of soil and Inhalation of dust generated from on-site soils	No	It is considered unlikely that recreational receptors in Tarro Reserve would be exposed to site-derived PFAS impacts in soil and dust during recreational activities.
Incidental ingestion of groundwater	No	No extractive uses of groundwater have been identified within Tarro Reserve.
Incidental ingestion of surface water and sediments	Yes	There is potential for recreational users of Tarro Reserve to enter the waterway for the purposes of primary contact recreation (swimming). However, the water use survey did not indicate that local residents are utilising Tarro Reserve for the purpose of primary contact recreation.
Ingestion of aquatic biota from Tarro Reserve	No	Local residents indicated that fishing was not undertaken within Tarro Reserve due to proximity to popular fishing waterways such as the Hunter River and Nelson Bay.
Ecological receptors that inhabit or forage within Tarro Reserve		
Ingestion of soil/sediment during foraging activities	Yes	The presence of PFAS in stormwater discharging to Tarro Reserve, and in surface water bodies in the reserve and adjacent wetland, indicates that there is potential for ecological receptors to be exposed as a result of ingestion of environmental media and as a result of the ingestion of PFAS accumulated within biota.
Ingestion of surface water within Tarro Reserve	Yes	
Ingestion of aquatic and terrestrial biota in Tarro Reserve	Yes	

5.6 Conceptual Site Model Summary

The conceptual site model for the site and surrounding off-site areas has been depicted in a flow diagram in **Figure 8**.

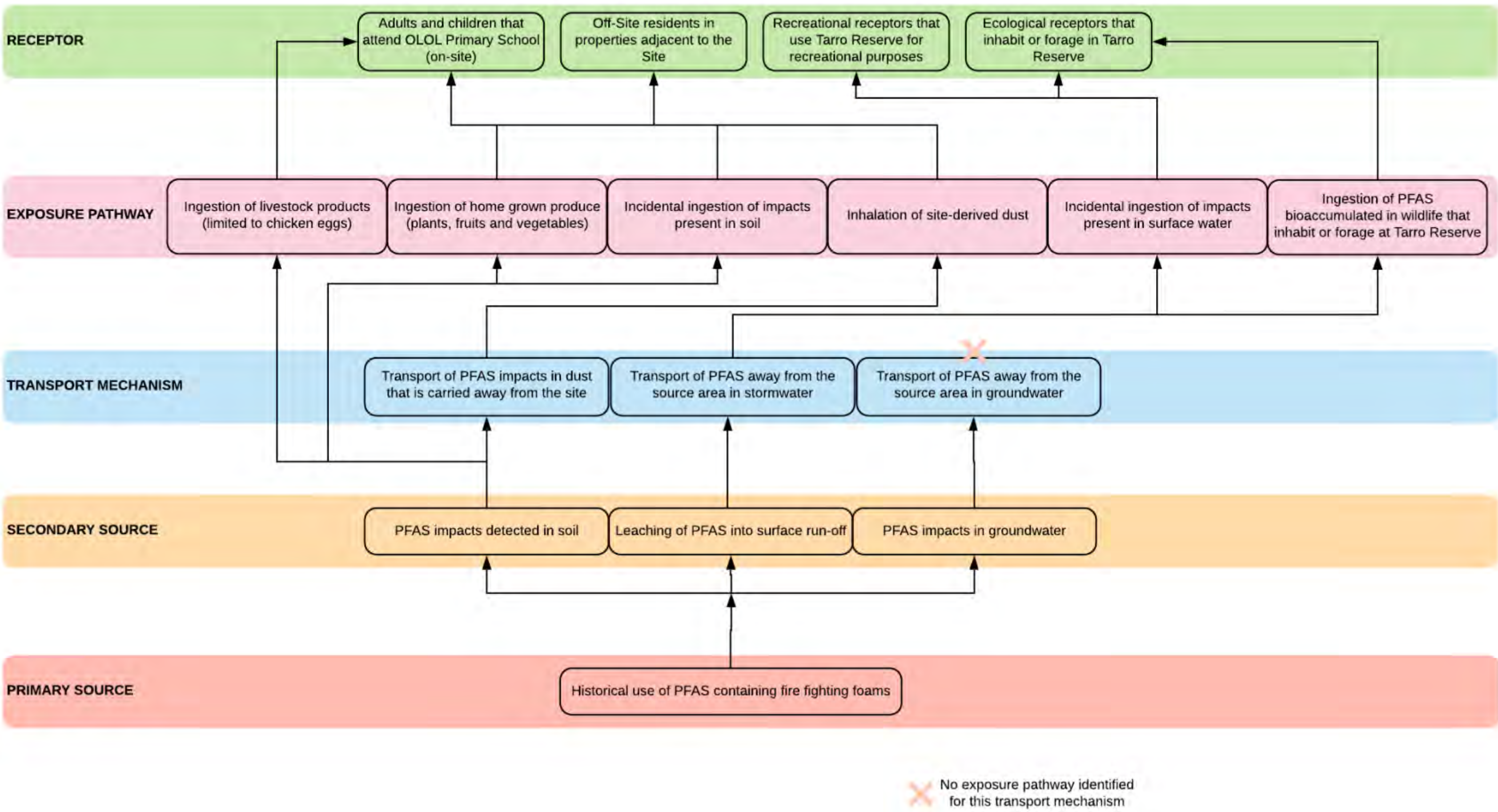

Figure 8: Conceptual Site Model Summary

6. Toxicity Assessment

The toxicity assessment stage of a risk assessment is comprised of two components: hazard identification and dose-response assessment. The hazard identification stage is a qualitative description of the capacity of a contaminant or agent to cause harm. The dose-response assessment includes the selection of appropriate toxicity criteria from a hierarchy of sources, in accordance with Schedule B4 of the ASC NEPM (2013).

6.1 Hazard Identification

The hazard identification process involves a review of existing toxicological information from appropriate sources to describe the capacity of a specific agent to produce adverse health effects. The following is a summary of the outcomes of the hazard assessment as it relates to human exposures:

- The scientific literature on the effects of these chemicals on people is inconclusive. However, testing on animals has shown some effects at low doses (FSANZ, 2018).
- There is no consistent evidence that exposure to PFAS causes adverse human health effects (FSANZ, 2017b).
- Studies have shown that only a small amount of PFAS can enter the human body through the skin barrier (ATSDR, 2018).
- The primary exposure route for PFOS, PFOA and PFHxS is likely ingestion of contaminated water or food. PFAS can then be readily absorbed in the gastrointestinal tract. PFAS are not volatile but may be inhaled into the lungs with dust generated during indoor or outdoor activities, however this is not thought to be a major exposure route for the general public. A study conducted by the NSW Government identified that dust inhalation accounts for a very small proportion of daily intake of PFAS in areas directly surrounding impacted sites (NSW EPA, 2017).
- PFAS readily bind to albumin and low-density lipoproteins in human, rat, bovine and monkey plasma, accumulating primarily in blood, liver and kidney tissue. PFAS have both lipophobic and hydrophobic properties precluding them from accumulating in fatty tissue.
- The body does not metabolise PFOS, PFOA, PFHxS or PFHxA but it is possible for longer chain PFAS compounds to oxidise, forming these shorter chain compounds within the body.
- The primary elimination methods from the body for PFAS are via urine, breast milk, and blood loss. The available data indicate that PFAS is passed out of females more quickly than males. Average half-lives in humans range from 2.3-8.67 years.
- It is not known if there are any toxic effects on humans from acute exposure to PFAS. A literature review by ToxConsult (2016a, 2016b) did not identify any case reports of human health effects from acute exposure to high doses of PFOS.
- The toxic effects of chronic exposure to PFAS are not well understood in humans. Potential associations have been identified by the USEPA (2016) with increased serum cholesterol and decreased birth weights but a review of these studies by FSANZ (2017b) concluded that it is not possible to determine if these changes were caused directly by PFOS or PFOA, or if there were other factors involved.
- In animals, the most sensitive toxic effects of PFAS relate to hepatic and developmental toxicity. Due to large interspecies differences in toxicokinetics of PFAS, and mechanisms of toxicity that are not shared between the species, extrapolation of animal data to exposure in humans is highly uncertain.

- While immune effects have been observed in mice following acute and intermediate-duration PFAS exposure, these data do not suggest that PFAS are immunotoxic in rats or monkeys. A literature review by FSANZ (2017b) concluded that "*there are both positive and negative studies showing associations for increasing PFOS and PFOA concentrations to compromise antibody production in humans. However, to date there is no convincing evidence for increased incidence of infective disease associated with PFOS or PFOA effects on human immune function*."
- PFOS, PFOA, PFHxS and PFHxA are not mutagenic or genotoxic. High exposures of PFOS and PFOA have been linked to tumour formation in animal tests. Tumour formation for both PFOS and PFOA was observed at greater exposure doses than that at which other health effects occurred. It is also noted that due to the differences between rats and humans, as well as the manner in which high exposure to PFOS induced tumour growth in rats, it is unlikely that the tumour formation observed in rats will occur in humans. Epidemiological studies have yet to provide convincing evidence of a correlation between any type of cancer in humans and PFOS or PFHxS. There have been some associations noted between certain human cancers and PFOA, but contradictory results have been seen between epidemiological studies and a causal relationship cannot be established with certainty.

The following is a summary of the outcomes of the hazard assessment as it relates to ecological exposures:

- The per-fluorinated sub-group of PFAS (including PFOS, PFOA and PFHxS) are highly resistant to degradation in the environment. This results in these compounds tending to bioaccumulate and biomagnify up the food chain, with the highest concentrations of PFAS compounds frequently measured in apex predators.
- PFOS will strongly adsorb to soils and sediments while PFOA is less readily adsorbed and may be more mobile in soils. Impacts adsorbed to sediment can be remobilised back into the surface water over time or enter the food chain. Both PFOS and PFOA have a high solubility in freshwater, with decreasing solubility seen with increasing salinity.
- In freshwater ecosystems, zebrafish show a reduction in fecundity of 34% when exposed to a PFOS concentration of 500 µg/L for two-weeks. This increased to 47% when the exposure time was increased to three weeks. Chronic PFOS exposure of >50 µg/L resulted in decreased body length and weight, altered sex ratio and impaired male gamete function in adult zebrafish. It also produced a decrease in embryo development and larval survival (CRC CARE 2017).
- The most sensitive freshwater macroinvertebrate to PFOS contamination were midges. Emergence success decreased in the presence of surfactants and PFOS may also interfere with the function of haemoglobin in midges (CRC CARE 2017).
- There have been comparatively few studies investigating the toxicity of PFAS in the marine environment compared with those for the freshwater environment. Salinity can affect the transport of PFAS and it is thus important to consider toxicity in marine organisms separately from freshwater species. CRC CARE (2017) noted a study where an intertidal copepod (*Tigriopus japonicas*) was exposed to PFOS concentrations of up to 1 mg/L and was found to have decreases in reproduction and growth of individuals at concentrations of 0.25 mg/L. Another study noted in CRC CARE (2017) found that teleost fish (*Oryzias melastigma*) had impaired gene expression relating to cardiac development, specifically effecting heart formation and heart rate, when exposed to PFOS at a minimum of 8 days post-fertilisation.
- In the terrestrial environment earthworms bioaccumulate PFAS through exposure to porewater and ingestion of soil. Reduced earthworm growth was observed after 42 days of exposure to PFOS at a concentration of 120 mg/kg (CRC CARE 2017).

6.2 Dose-Response Assessment

The aim of the dose-response assessment is to assess the potential for adverse (and non-adverse) effects associated with increased exposure to a substance as a result of contamination. The dose-response assessment also aims to identify the screening benchmarks and tolerable daily intakes (TDI) which can be used to quantify the potential for adverse effects.

As this HHERA focuses solely on potential risks associated with exposure to PFAS which, as outlined above, are bioaccumulative there is a need to assess potential toxic effects as a result of direct contact as well as from bioaccumulation. Therefore, the dose-response assessment includes selection of screening benchmarks which are used to assess direct toxicity, as well as TDIs which are used to assess the potential for intakes including food sources where bioaccumulation may have occurred.

6.2.1 Screening Benchmarks

CoPC are considered to be those chemicals which are known or suspected to be present at concentrations which may warrant inclusion in the human health and ecological risk assessments. In general, a chemical is selected as a CoPC if it has been reported to be present in environmental media at the site above relevant screening criteria (refer to attached **Table T1** and **Table T2**).

6.2.1.1 Human Health Risk Assessment

The following sources have been referenced during selection of relevant human health screening benchmarks for use in the HHERA:

» HEPA (2018) PFAS National Environmental Management Plan (PFAS NEMP)

» NHMRC (2019) Guidance on Per and Polyfluoroalkyl substances (PFAS) in Recreational Water

It is noted that a water use survey conducted for residents adjacent to the site identified that the town reticulated water supply is the main source of drinking water for residents. Water sources at OLOL Primary School are also derived from the town reticulated water supply, therefore no **consideration** of drinking water exposures relating to surface water or groundwater were warranted at the site or for surrounding receptors.

Table 7: Summary of Adopted Human Health Screening Benchmarks

PFAS Compounds	Exposure Scenario			Source/Justification
	On-site OLOL School Community	Off-site Residents	Off-site Recreational Receptors	
Soil (mg/kg)				
PFOS + PFHxS	0.009 (1.67)	0.009	1	HEPA (2018) (SSSL)
PFOA	0.1 (13.35)	0.1	10	HEPA (2018) (SSSL)
Surface Water (µg/L)				
PFOS + PFHxS	2	2	2	NHMRC (2019)
PFOA	10	10	10	NHMRC (2019)

Note: site specific screening levels (SSSL) were derived in the DSI (Nation Partners, 2019a) and have also been considered herein. However, as a conservative approach the HEPA (2018) screening criteria have been adopted for Tier 1 screening purposes.

6.2.1.2 Ecological Risk Assessment

The following sources have been referenced during selection of relevant ecological screening benchmarks:

» HEPA (2018) PFAS National Environmental Management Plan (PFAS NEMP)

» Environment and Climate Change Canada (ECCC) 2017. Federal Environmental Quality Guidelines, Perfluorooctane Sulfonate (PFOS). February 2017.

Table 8: Summary of Adopted Ecological Screening Benchmarks

PFAS Compound	Screening Value	Source/Justification
Soil (direct contact) (mg/kg)		
PFOS	1	HEPA (2018) – Public open space
	0.01	HEPA (2018) – Residential
PFOA	10	HEPA (2018) – Public open space
Soil (dietary exposure resulting from incidental soil ingestion and bioaccumulation) (mg/kg)		
PFOS	0.01	HEPA (2018) – Residential: Based on ECCC (2017) - Secondary consumers – assumes consumers may ingest PFOS from soil and invertebrates (95% of diet), plants (2.5% of diet) and small mammals (2.5% of diet)
	2.2	ECCC (2017) - Primary consumers (herbivorous mammals) – assumes consumers ingest PFOS from soil and plants (100% of diet)
Surface Water (µg/L)		
PFOS	0.00023	HEPA (2018) – freshwater 99%species protection value
	0.13	HEPA (2018) – freshwater 95% species protection value
PFOA	19	HEPA (2018) – freshwater 99%species protection value
	220	HEPA (2018) – freshwater 95% species protection value

6.2.2 Human Health Tolerable Daily Intakes

The following table provides a summary of the published health-based guideline values (HBGV) for PFOS, PFOA, PFHxS and PFHxA which were considered during selection of the tolerable daily intakes (TDI) adopted herein.

Table 9: Summary of Available Health Based Guideline Values

Reference	HBGV	POD	UF	HBGV
PFOS				
UKCOT, 2006	TDI (provisional)	0.03 mg/kg bw/day	100	300 ng/kg bw/day
EFSA, 2008	TDI	0.03 mg/kg bw/day	200	150 ng/kg bw/day
Swedish EPA, 2012	Derived NOAEL (immunotoxicity)	17.8 ng/L	150	0.12 ng/mL serum
Danish EPA, 2015	TDI	0.033 mg/kg bw/day	1230	30 ng/kg bw/day
ATSDR, 2018	MRL	0.000515 mg/kg bw/day	30 (10 mod-factor)	2 ng/kg bw/day
USEPA, 2016	RfD	0.00051 mg/kg bw/day	30	20 ng/kg bw/day
FSANZ, 2017	TDI	0.0006 mg/kg bw/day	30	20 ng/kg bw/day
PFHxS				
UKCOT, 2006	TDI (provisional)	0.03 mg/kg bw/day	200	1.5µg/kg bw/day
EFSA, 2008	TDI	0.03 mg/kg bw/day	200	1.5µg/kg bw/day
Swedish EPA, 2012	Derived NOAEL	150 ng per mL of serum	75	2.0 ng/mL serum
Danish EPA, 2015	TDI	0.003 mg/kg bw/day	30	100 ng/kg bw/day
ATSDR, 2018	MRL	0.0047 mg/kg bw/day	30 (10 mod-factor)	20 ng/kg bw/day
USEPA, 2016	RfD	1.54×10^{-3} mg/kg bw/day	300	20 ng/kg bw/day
FSANZ, 2017	TDI	0.0049 mg/kg bw/day	30	160 ng/kg bw/day
PFOA				
UKCOT, 2006	TDI (provisional)	0.03 mg/kg bw/day	200	1.5µg/kg bw/day
EFSA, 2008	TDI	0.03 mg/kg bw/day	200	1.5µg/kg bw/day
Swedish EPA, 2012	Derived NOAEL	150 ng per mL of serum	75	2.0 ng/mL serum

Reference	HBGV	POD	UF	HBGV
Danish EPA, 2015	TDI	0.003 mg/kg bw/day	30	100 ng/kg bw/day
ATSDR, 2018	MRL	0.000821 mg/kg bw/day	300	3 ng/kg bw/day
USEPA, 2016	RfD	1.54×10^{-3} mg/kg bw/day	300	20 ng/kg bw/day
FSANZ, 2017	TDI	0.0049 mg/kg bw/day	30	160 ng/kg bw/day
PFHxA				
Danish EPA, 2015	TDI (hepatic toxicity)	20 mg/kg bw/day	200	100 µg/kg bw/day
	TDI (reproductive toxicity)	100 mg/kg bw/day	200	1,000 µg/kg bw/day
ToxConsult (2016b) based on data from Klaunig *et al* (2015)	NOAEL (renal toxicity)	30 mg/kg bw/day	300	100 µg/kg bw/day

Note:

mg/kg bw/day = Milligrams per kilogram body weight per day

µg = micrograms

ng = nanograms

TDI = Tolerable daily intake

NOAEL = no observable adverse effect level

MRL = minimal risk level

POD = point of departure

UF = uncertainty factor

The following table provides a summary of the adopted human health tolerable daily intakes (TDIs) along with sources and the details of TDI calculation.

Table 10: Adopted Human Health Tolerable Daily Intakes

Analyte	Adopted Oral TDI (mg/kg bw/day)	Source	Discussion of Derivation
PFOS	0.00002	FSANZ (2017)	Point of Departure (POD): a Human Equivalent Dose (HED) NOAEL of 0.0006 mg/kg/day was identified based on a study in female rats (Luebkar *et al*., 2005). The critical effects considered were parental toxicity (decreased body weight gain and food consumption) and offspring toxicity (reduced body weight and weight gain). Uncertainty Factor (UF): an UF of 30 was applied to account for intraspecies variability in human populations and for interspecies differences in toxicodynamics.
PFOA	0.00016	FSANZ (2017)	POD: a HED LOAEL of 0.0049 mg/kg/day based on studies in mice (Lau et al., 2006). The critical effect considered was foetal toxicity. UF: an UF of 30 was applied to account for intraspecies variability in human populations and for interspecies differences in toxicodynamics.
PFHxS	0.00002	FSANZ (2017)	FSANZ (2017) PFOS TDI as FSANZ stated that '*there was insufficient toxicological and epidemiological information to justify establishing a TDI for PFHxS. In the absence of a TDI, it is reasonable to conclude that the enHealth (2016) approach of using the TDI for PFOS is likely to be conservative and protective of public health as an interim measure*.'
PFHxA	0.1	ToxConsult (2016)	In the absence of a TDI from FSANZ (2017), the provisional TDI for PFHxA from ToxConsult (2016) was adopted. This TDI is based on a two-year chronic/carcinogenicity study by Klaunig et al (2015). POD: a NOAEL of 30 mg/kg/day for female rates based on observations of kidney necrosis. UF: an UF of 300 was applied to account for animal and human differences in toxicodynamics and toxicokinetics, human variability in toxicodynamics and human variability in toxicokinetics.

6.2.2.1 Background Exposure

When evaluating potential health effects or deriving health-based investigation levels for chemicals assessed on the basis of a threshold dose-response criteria, total exposure to a given chemical (i.e. the sum of the background exposure and the substance exposure from contaminated media) should not exceed the TDI (enHealth, 2004; ASC NEPM, 2013). As PFAS are in a range of consumer products, it is considered likely that background exposures may occur on an almost daily basis. The exposures that occur as a result of the presence of PFAS in food, water and consumer products are considered to be in addition to potential exposures that may occur on-site or in adjacent off-site environments. The background exposures to PFAS have been accounted for by adjusting the adopted TDIs during exposure modelling.

The review of background sources conducted by ATSDR (2015) indicates that the wider population is exposed to PFAS from a range of sources as a result of the presence of PFAS in surface protection products such as carpet and clothing treatment, and as coating for paper and cardboard packaging. It is also noted that the relatively ubiquitous nature of PFAS in the environment (as a result of releases from around the world) is such that PFAS is likely to be present at low levels in food products.

Assumed background exposures have been adopted based on a literature review conducted by ToxConsult (2016). Estimated background exposures from ToxConsult (2016) were estimated based on measured serum data from the Australian population and the half-lives of PFAS compounds. No background intake data are available for PFHxS and PFHxA therefore no background exposure has been assumed in the modelling for these compounds.

Table 11: Adopted Background intake assumptions (ToxConsult, 2016)

Analyte	Oral TDI (mg/kg bw/day)	Background Intake (mg/kg/day)	Background Intake as a Percentage of the TDI
PFOS	0.00002	0.0000014	7%
PFOA	0.00016	0.00000078	<1%
PFHxS	0.00002	No background assumed	-
PFHxA	0.1	No background assumed	-

6.2.3 Ecological Toxicity Reference Values

No ecological toxicity reference values have been adopted herein as no quantitative or semi-quantitative exposure modelling has been conducted for ecological receptors.

7. Human Health Risk Assessment

7.1 Quantitative Exposure Assessment

The exposure assessment aims to determine the magnitude, frequency, extent and duration of exposure to a contaminant(s) at the site. The information compiled in the CSM was used to determine the numerical representation of likely exposures that may occur at the site.

7.1.1 Exposure Parameters

Human exposure parameters adopted in this risk assessment were obtained from the following recognised Australian and International sources:

» EnHealth, 2012;

» ASC NEPM, 2013;

» USEPA, 1989 and updates to this document

Where specific guidance was not available from the above or other literature sources, conservative estimates for exposure parameters have been adopted. Human exposure parameters adopted in this assessment and their source justification are summarised in **Appendix B**.

Table 12: Summary of Key Exposure Parameters

Parameter	Units	Adult	Reference	Child	Reference
Adults and children that attend OLOL Primary School (on-site)					
Body weight	kg	70	NEPC (2013)	24	The average body weight of children aged 4 to <8 years old as listed in the enHealth (2012) exposure factors guide has been adopted as children who attend the primary school will be 5 years old (or older).
Exposure duration	yr	30	Assumes teachers may work at the same school for up to 30 years.	8	It is assumed that children will attend the school from kindergarten through to grade six plus the potential for a child to repeat up to one year of schooling.
Exposure frequency	days/yr	210	Site-specific assumption – assumes teachers will be at school for 4 x 10 week terms plus some additional days if they attend the school on the weekend or where terms are slightly longer than 10 weeks.	210	Site-specific assumption – assumes children will be at school for 4 x 10 week terms plus some additional days if they play at the school on the weekend or where terms are slightly longer than 10 weeks.
Averaging time (non-carcinogens)	yr	30	Assumes teachers may work at the same school for up to 30 years.	8	It is assumed that children will attend the school from kindergarten through to grade six plus the potential for a child to repeat up to one year of schooling.
Daily soil ingestion rate	mg/day	50	NEPC (2013)	100	NEPC (2013)
Exposure time (outdoor air)	hrs/day	4	This assumes that teachers may spend up to 4 hours per day in the school yard.	4	This assumes that children may spend up to 4 hours per day in the school yard.
Exposure frequency (outdoor air)	days/yr	210	Site-specific assumption - assumes teachers will be at school for 4 x 10 week terms plus some additional days if they attend the school on the weekend or where terms are slightly longer than 10 weeks.	210	Site-specific assumption - assumes children will be at school for 4 x 10 week terms plus some additional days if they play at the school on the weekend or where terms are slightly longer than 10 weeks.

Parameter	Units	Adult	Reference	Child	Reference
Particulate emission factor (outdoor air)	m3/kg	2.60 x 10^{07}	NEPC (2013) - Recreational User PEF has been adopted.	2.60 x 10^{07}	NEPC (2013) - Recreational User PEF has been adopted.
Lung Retention Factor (dust inhalation)	unitless	0.375	NEPC (2013)	0.375	NEPC (2013)
Fraction of produce consumed from the site	%	10	NEPC (2013)	10	NEPC (2013)
Consumption Rate - Chicken Eggs	g/day	59	FSANZ (2017) P90 value for people aged 2 years and above. Assuming each serving consists of two eggs (weighing up to 120 g), and that 10% of the eggs consumed were collected from the site, this would be equivalent to 1.5 serves (3 eggs) per month from the site.	36	FSANZ (2017) P90 value for children aged 2-6 Assuming each serving consists of two eggs (weighing up to 120 g total), and that 10% of the eggs consumed were collected from the site, this would be equivalent to 1 serve (2 eggs) per month from the site.
Consumption Rate - Fruit	kg/day	0.14	NEPC (2013)	0.18	NEPC (2013)
Consumption Rate - Green Vegetables	kg/day	0.15	NEPC (2013) assumes 59% of vegetables consumed (260 g/day) are green vegetables	0.055	NEPC (2013) assumes 55% of vegetables consumed (100 g/day) are green vegetables
Consumption Rate - Tuber Vegetables	kg/day	0.060	NEPC (2013) assumes 23% of vegetables consumed (260 g/day) are tuber vegetables	0.028	NEPC (2013) assumes 28% of vegetables consumed (100 g/day) are tuber vegetables

Parameter	Units	Adult	Reference	Child	Reference
Consumption Rate - Root Vegetables	kg/day	0.047	NEPC (2013) assumes 18% of vegetables consumed (260 g/day) are root vegetables	0.017	NEPC (2013) assumes 17% of vegetables consumed (100 g/day) are root vegetables
Residents that inhabit properties adjacent to the site (off-site)					
Body weight	kg	70	NEPC (2013)	15	NEPC (2013)
Exposure duration	yr	29	NEPC (2013)	6	NEPC (2013)
Exposure frequency	days/yr	365	NEPC (2013)	365	NEPC (2013)
Averaging time (non-carcinogens)	yr	29	NEPC (2013)	6	NEPC (2013)
Daily soil ingestion rate	mg/day	50	NEPC (2013)	100	NEPC (2013)
Exposure time (outdoor air)	hrs/day	4	NEPC (2013)	4	NEPC (2013)
Exposure time (indoor air)	hrs/day	20	NEPC (2013)	20	NEPC (2013)
Particulate emission factor (outdoor air)	m^3/kg	2.90×10^{10}	NEPC (2013)	2.90×10^{10}	NEPC (2013)
Indoor Air Dust Factor	m^3/kg	2.60×10^{07}	NEPC (2013)	2.60×10^{07}	NEPC (2013)

Parameter	Units	Adult	Reference	Child	Reference
Lung Retention Factor (dust inhalation)	unitless	0.375	NEPC (2013)	0.375	NEPC (2013)
Fraction of produce consumed from the site	%	10	NEPC (2013)	10	NEPC (2013)
Consumption Rate - Fruit	kg/day	0.14	NEPC (2013)	0.18	NEPC (2013)
Consumption Rate - Green Vegetables	kg/day	0.15	NEPC (2013) assumes 59% of vegetables consumed (260 g/day) are green vegetables	0.055	NEPC (2013) assumes 55% of vegetables consumed (100 g/day) are green vegetables
Consumption Rate - Tuber Vegetables	kg/day	0.060	NEPC (2013) assumes 23% of vegetables consumed (260 g/day) are tuber vegetables	0.028	NEPC (2013) assumes 28% of vegetables consumed (100 g/day) are tuber vegetables
Consumption Rate - Root Vegetables	kg/day	0.047	NEPC (2013) assumes 18% of vegetables consumed (260 g/day) are root vegetables	0.017	NEPC (2013) assumes 17% of vegetables consumed (100 g/day) are root vegetables
Recreational receptors that use Tarro Reserve					
Body weight	kg	70	NEPC (2013)	15	NEPC (2013)
Exposure duration	yr	29	NEPC (2013)	6	NEPC (2013)
Averaging time (non-carcinogens)	yr	29	NEPC (2013)	6	NEPC (2013)

Parameter	Units	Adult	Reference	Child	Reference
Incidental ingestion rate	L/day	0.05	enHealth (2012) suggest the use of an average incidental water ingestion rate for adults of 25 mL/hr, the adopted ingestion rate assumes receptors will be conducting recreational activities at Tarro Reserve for up to two hours per day	0.1	enHealth (2012) suggest the use of an average incidental water ingestion rate of 50 mL/hr for children the adopted ingestion rate assumes receptors will be conducting recreational activities at Tarro Reserve for up to two hours per day
Exposure frequency for incidental water ingestion	days/yr	52	Professional judgement - assumes recreational receptors will conduct recreational activities at Tarro Reserve one day per week, or two days per week for half a year	52	Professional judgement - assumes recreational receptors will conduct recreational activities at Tarro Reserve one day per week, or two days per week for half a year

7.1.2 Exposure Point Concentration

A key element of the risk assessment process is estimation of the concentration of site-derived contaminant that identified receptors may be exposed to. This concentration is termed the exposure point concentration (EPC) and is selected to represent the best estimation of average exposures to contamination in environmental media at the point of exposure. Typically, an individual receptor is assumed to be equally exposed to media within all portions of the exposure unit over the time frame of the risk assessment.

For the purposes of the current HHERA, and to account for potential uncertainty associated with human behaviours, it has been assumed that receptors will be exposed to the maximum reported concentration in each environmental media for the duration of the assumed exposure period. It is more likely that receptors will be exposed to a lower concentration, however a conservative approach was considered appropriate at this stage.

Table 13: Summary of Exposure Point Concentrations

Analyte	Adults and children that attend OLOL Primary School (on-site)	Residents that inhabit properties adjacent to the Site (off-site)	Recreational receptors that use Tarro Reserve	Comments
Soil (mg/kg)				
PFOS	2.5	0.15	N/A	The maximum reported concentration in surficial soils (0-0.4 m bgl) has been adopted as the exposure point concentration to provide a conservative indication of potential risks associated with soil exposure pathways.
PFHxS	0.078	0.005	N/A	
PFOA	0.32	0.009	N/A	
PFHxA	0.073	0.005	N/A	
Surface Water (mg/L)				
PFOS	N/A	N/A	0.0012	The maximum reported concentration in off-site surface water has been adopted as the exposure point concentration to provide a conservative indication of potential risks associated with surface water exposure pathways.
PFHxS	N/A	N/A	0.00004	
PFOA	N/A	N/A	0.00038	
PFHxA	N/A	N/A	0.00016	

Note:

N/A – no exposure point concentration has been adopted as no SPR linkage has been identified for these receptors.

7.1.3 Estimation of Chemical Intakes

Chemical intakes (doses) or adjusted exposure air concentrations (for assessment of inhalation exposure) relevant to the assessment of exposures to PFAS by relevant receptors and pathways are detailed in **Appendix B** and were estimated using the equations detailed below (primarily based on USEPA, 1989 algorithms as adopted by the ASC NEPM).

Incidental ingestion of soil

The following methodology was applied to estimate risks to human health as a result of PFAS exposure through the incidental ingestion of contaminated soil and dust during everyday activities. This is an important exposure pathway for non-volatile chemicals.

$$\mathrm{CDI_{ing,s}} = \frac{\mathrm{C}_s * \mathrm{IngR}_s * \mathrm{FI} * \mathrm{B} * \mathrm{EF} * \mathrm{ED} * \mathrm{CF}}{365\,\frac{\mathrm{days}}{\mathrm{year}} * \mathrm{AT} * \mathrm{BW}}$$

Equation 1

Where:

$CDI_{ing,s}$	= Chronic Daily Intake via incidental soil ingestion (mg/kg/day)
C_s	= Chemical Concentration in soil (mg/kg)
$IngR_s$	= Ingestion Rate via incidental soil ingestion (mg/day)
B	= Bioavailability
EF	= Exposure Frequency (days/year)
ED	= Exposure Duration (years)
FI	= Fraction ingested from contaminated source (unitless)
CF	= Unit conversion factor (kg/10^6 mg)
AT	= Averaging Time (years)
	= 70 years for non-threshold carcinogens
	= ED for chemicals assessed based on threshold effects
BW	= Body weight (kg)

Inhalation of dust

The following methodology was applied to estimate risks to human health as a result of PFAS exposure through the inhalation of particulates in the air. It is assumed that all particulates are small enough to penetrate deeply into the lungs and that the particulate air exposure point concentrations have been estimated as inspirable particulate matter (PM_{10}) dust concentrations.

$$\mathrm{EC_{inh}} = \frac{\mathrm{C_a} * \mathrm{RF} * \mathrm{ET} * \mathrm{B} * \mathrm{EF} * \mathrm{ED}}{\mathrm{AT} * 365\frac{\mathrm{days}}{\mathrm{year}} * 24\frac{\mathrm{hours}}{\mathrm{day}}}$$

Equation 2

Where:

EC_{inh}	= Exposure Adjusted Air Concentration (mg/m^3)
C_a	= Chemical Concentration in Air (mg/m^3)
RF	= Lung retention factor relevant to the inhalation of dust and includes consideration of a deposition fraction and ciliary clearance
ET	= Exposure Time (hours/day)
B	= Bioavailability
EF	= Exposure frequency (days/year)
ED	= Exposure duration (years)
AT	= Averaging time (years)
	= ED for threshold chemicals

Note: When assessing outdoor inhalation of particulates, the chemical concentration in outdoor airborne particulates ($C_{a,out}$) is calculated as:

$$\mathrm{C_{a,out}} = \frac{\mathrm{C_s}}{\mathrm{PEF}}$$

Equation 3

A significant portion (50%) of indoor dust can be attributed to soil that has been tracked in from the outdoors. The indoor dust transport factor (TF) plays a role in the chemical concentration of indoor airborne particulates, as shown in Equation 4 below.

$$C_{a,in} = \frac{C_s}{PEF} * TF$$

Equation 4

Incidental ingestion of water during primary contact recreation (e.g. swimming)

The following methodology was applied to estimate risks to human health as a result of PFAS exposure through incidental water ingestion during primary contact recreation (e.g. swimming). This equation has been used to assess exposures as a result of incidental ingestion of water during swimming in the waterbody within Tarro Reserve.

$$CDI_{ing,w} = \frac{C_w * IngR_w * ET * B * FI * EF * ED}{365\frac{days}{year} * AT * BW}$$

Equation 5

Where:

$CDI_{ing,w}$	= Chronic Daily Intake (incidental) of surface water (mg/kg/day)
C_w	= Chemical Concentration in surface water (mg/L)
$IngR_w$	= Incidental ingestion Rate for surface water (L/day)
	= the duration of swimming (hours/day) multiplied by the hourly ingestion rate (L/hour)
ET	= Exposure time, i.e. the duration of swimming (hours/day)
B	= Bioavailability
EF	= Exposure Frequency (days/year)
ED	= Exposure Duration (years)
FI	= Fraction ingested from contaminated source (unitless)
AT	= Averaging Time (years)
	= 70 years for non-threshold carcinogens
	= ED for chemicals assessed based on threshold effects
BW	= Body weight (kg)

It is noted that the exposure parameters presented in **Appendix B** do not include a specific exposure time line item, however the incidental ingestion rate for water (in mL/day) has been multiplied by the assumed exposure time and thus a total surface water ingestion volume has been included in the modelling.

Ingestion of Home Grown Produce (eggs, fruit and vegetables)

The following methodology was applied to estimate risks to human health as a result of PFAS exposure through the ingestion of home grown produce including chicken eggs, fruits and vegetables.

$$\mathrm{CDI_{ing,p}} = \frac{\mathrm{C_p} * \mathrm{IngR_p} * \mathrm{FI} * \mathrm{EF} * \mathrm{ED} * \mathrm{CF}}{365\frac{\mathrm{days}}{\mathrm{year}} * \mathrm{AT} * \mathrm{BW}}$$

Equation 6

Where:

$CDI_{ing,p}$	= Chronic Daily Intake of produce (mg/kg/day)
C_p	= Chemical Concentration in produce (mg/kg)
$IngR_p$	= Ingestion Rate of produce (mg/day)
EF	= Exposure Frequency (days/year)
ED	= Exposure Duration (years)
FI	= Fraction ingested from contaminated source (unitless)
CF	= Unit conversion factor (kg/10^6 mg)
AT	= Averaging Time (years)
	= 70 years for non-threshold carcinogens
	= ED for chemicals assessed based on threshold effects
BW	= Body weight (kg)

Due to the limited number of produce samples collected from on-site and surrounding residential gardens, and the absence of detectable concentrations of PFOS, PFOA, PFHxS, and PFHxA in the biota samples collected (**Table T3**), PFAS intake associated with ingestion of home grown produce has been modelled based on the below equations:

Concentration in Eggs (adopted from US EPA, 2005)

$$C_{egg} = \frac{\left[\sum\left(F_i * \ Q_{pi} * P_i\right) + \left(Q_s * C_s * B_s\right) + \left(Q_w * C_w\right)\right] * TF}{LR * E_w}$$

Equation 7

Where:

C_{egg}	= Concentration of PFAS in eggs (mg/kg)
Fi	= Fraction of plant type grown on contaminated soil and ingested by the animal (chicken) (unitless). Assumes that chickens may consume plant material grown on the site as a portion of their diet.
Q_{pi}	= Quantity of plant type eaten by the animal each day (kg/day)
P_i	= Concentration of PFAS in plant type eaten by the animal (chicken) (mg/kg)
Q_s	= Quantity of soil eaten by the animal (chicken) (kg/day)
C_s	= Concentration in soil over the exposure duration (mg/kg)

B_s	= Soil bioavailability factor (unitless)
Q_w	= Quantity of water (L)
C_w	= Concentration in water over the exposure duration (mg/L)
TF	= Transfer factor into eggs (based on study by Kowalczyk 2014), chemical specific constant.
LR	= Laying rate – average number of eggs laid per day (assumes chickens lay one egg up to 5 times per week)
E_w	= Average weight of edible portion of egg (kg)

Note that it has been assumed that chickens housed on the site would consume tap water or rain water that does not contain detectable concentrations of PFAS. Thus, the drinking water exposure pathway has not been assessed for chickens at the site.

Table 14: Chicken Egg Transfer Factor Parameters

Parameters	Units	Value	Reference/Justification
Fraction of plant type grown on contaminated soil and ingested by the animal (chicken)	unitless	1	Professional judgement. Assumed 100% from source area
Quantity of plant type eaten by the animal each day	kg DW plant/day	0.105	Professional judgement, based on information provided by NSW department of agriculture (https://www.dpi.nsw.gov.au/animals-and-livestock/poultry-and-birds/poultry-planning-and-keeping/planning-for-poultry-development/bpm)
Quantity of soil eaten by the animal	kg/day	0.0105	Professional judgement. Assumes 10% of feed quantity may be made up of soil
Laying Rate	eggs/day	0.9	Professional judgement.
Average weight of edible portion of the egg	kg	0.0563	Scolexia (2017)
Eggs Transfer Factor – PFOS	unitless	1	These values have been adopted from a report conducted by Scolexia/AECOM (2017). This study investigated PFAS uptake from drinking water into chicken eggs, however in the absence of soil-chicken-egg transfer values or data these transfer factors are considered to provide a conservative approach to estimating chicken egg concentrations.
Egg Transfer Factor – PFOA	unitless	0.46	
Egg Transfer Factor – PFHxS	unitless	0.69	
Egg Transfer Factor – PFHxA	unitless	0.005	

Plant Uptake Factor (ASC NEPM 2013)

$$IF_{PLANT} = ([CF_{tuber} * C_{tuber}] + [CF_{root} * C_{root}] + [CF_{green} * C_{green}] + [CF_{gruit} * C_{fruit}])$$

Equation 8

Where:

IF_{plant}	= Plant Intake factor calculated for the consumption of homegrown produce (kg/day)
CF_x	= Plant concentration factors relevant for produce type (x) (chemical-specific) (mg/kg produce to mg/kg soil)
C_x	= Consumption rate of each produce type (x) (kg/day)

This approach has been validated against the reported concentrations in plant samples collected from the site and has been identified to result in conservative plant PFAS concentrations. This approach is therefore considered appropriate given the uncertainty of future PFAS concentrations in home grown produce.

7.2 Risk Characterisation – Quantitative Modelling Outcomes

Risk characterisation is the final stage of the risk assessment process. The risk characterisation aims to summarise and integrate information from the data collection, exposure and toxicity assessment stages of risk assessment to identify the overall potential for unacceptable risks in the context of the CSM. Risk characterisation, as outlined in the ASC NEPM (2013) is comprised of three steps: risk estimation, risk evaluation and sensitivity/uncertainty analysis. The following sections reflect these three steps in the risk characterisation undertaken as part of the current HHRA.

7.2.1 Methodology

The following methodology was applied to estimate risks to human health as a result of PFAS exposure. As PFAS are considered non-carcinogenic the risks associated with exposure to these compounds is estimated using a threshold approach as follows:

$$HQ = \frac{CDI_t}{TDI - background} \qquad \text{Equation 9}$$

$$HQ = \frac{EC_{inh}}{RfC - background} \qquad \text{Equation 10}$$

Where:

HQ	= Hazard Quotient (unitless)
CDIt	= Chronic Daily Intake (calculated based on threshold averaging time, mg/kg/day)
TDI	= Tolerable Daily Intake (mg/kg/day) – adjusted for background intake
EC_{inh}	= Exposure adjusted air concentration (mg/m^3)
RfC	= Tolerable Concentration in air (mg/m^3) – adjusted for background intake

A potentially unacceptable chemical intake/exposure is indicated if the exposure level exceeds the TDI or RfC (i.e. if the hazard quotient is greater than 1).

To assess the overall potential for adverse health effects posed by exposure to multiple PFAS, the hazard quotient for each individual PFAS (for which a TDI was available) and exposure pathway relevant to a receptor was summed. The resulting sum is referred to as the hazard index (HI), and is calculated using the following equation.

$$HI = \sum_{i=1,j=1}^{n} HQ_{i,j}$$

Equation 11

Where:

HI	= Hazard Index (unitless)
$HQ_{i,j}$	= Hazard Quotient for pathway *i* and chemical *j* (unitless)
N	= Number of chemicals and/or pathways relevant to land use scenario

If the HI is less than one, the cumulative exposure to the CoPC is considered unlikely to result in adverse effects (i.e. unacceptable risk). If the sum is greater than one, a more detailed and critical evaluation of the hazards may be required, or appropriate risk management measures at the site may need to be implemented.

7.2.2 Risk Estimate

Table 15 provides a breakdown of the exposure pathway hazard quotients that have been factored into the final hazard quotient for each receptor group.

Table 15: Summary of Exposure Pathways Contributing to Hazard Indices for Each Receptor Group

Exposure Pathway	Adults and children that attend OLOL Primary School (on-site)		Residents that inhabit properties adjacent to the site (off-site)		Recreational receptors that use Tarro Reserve (off-site)	
	Adults	Children	Adults	Children	Adults	Children
Incidental Ingestion of Soil	0.06	0.4	0.006	0.06	-	-
Incidental Ingestion of Surface Water	-	-	-	-	0.008	0.08
Inhalation of soil derived dust in indoor air	0.00006	0.00006	0.00003	0.00003	-	-
Inhalation of soil derived dust in outdoor air	0.00006	0.00006	0.000000005	0.000000005	-	-
Ingestion of home grown produce (fruits and vegetables)	0.00002	0.00006	0.000002	0.000009	-	-
Ingestion of chicken eggs	13	23	-	-	-	-

A summary of the calculated reasonable maximum threshold risks (hazard indices) is presented in **Table 16** below.

Estimated hazard indices based on conservative exposure assumptions for all receptors (on-site and off-site) were below the adopted acceptable hazard index of 1, except for the potential future use of OLOL Primary School inclusive of chicken egg consumption. These estimated risk levels indicate that risks are low and acceptable for receptors and exposure pathways assessed, except for potential future chicken egg consumption at OLOL Primary School.

Table 16: Summary of Estimated Health Risks

Receptor	Adults and children that attend OLOL Primary School (on-site) - Current	Adults and children that attend OLOL Primary School (on-site) – Potential Future Increased Produce Consumption, **Excluding** Chicken Egg Consumption	Adults and children that attend OLOL Primary School (on-site) – Potential Future **Including** Chicken Egg Consumption	Residents that inhabit properties adjacent to the site (off-site) - Current	Recreational receptors that use Tarro Reserve (off-site) - Current
Adult	0.06	0.06	13	0.006	0.008
Child	0.4	0.4	23	0.06	0.08

Note: Values below the hazard index of 1 indicate that human health risks are low and acceptable.

7.2.3 Sensitivity Analysis

The risk estimates outlined in **Section 7.2.2** have been calculated using a range of exposure assumptions that have been adopted based on our current understanding of site conditions and potential future scenarios that may occur at the site. A number of conservative assumptions have been adopted to account for the uncertainty in the data and the uncertainty with regard to actual exposures under future conditions at the site. The cumulative effect of adopting multiple 'reasonable maximum' exposure assumptions can be an over-estimation of actual risks. A sensitivity analysis for the key exposure assumptions is presented in **Table 17**. Overall, this analysis indicates that the risk estimates are likely to overestimate risks, however, this overestimation is considered reasonable given the sensitivity of the school community and the uncertainties surrounding future plans to keep chickens and expand produce gardens for consumption by the school community.

Table 17: Sensitivity Analysis Summary

Exposure Parameter	Value Adopted in HHRA	Range of Possible Values	Potential impact on the risk conclusions
Exposure point concentration - soil	2.5 mg/kg	0.007 – 2.5 mg/kg 0.6 mg/kg (average) 0.79 mg/kg (95% upper confidence limit [UCL] – gamma distribution)	Adopting an average of 95% UCL concentration as the EPC would result in a lower estimation of risk to on-site receptors. However, the maximum on-site soil concentration was adopted to assess on-site exposures to account for the potential variability in soil concentrations, and uncertainties in behaviour of the children at the site including: » The school is understood to cater for children with special needs who may have behaviours that result in increased interactions with soil; or » Where children prefer to play in a particular area of the playground more often and where elevated PFAS concentrations may be present.

Exposure Parameter	Value Adopted in HHRA	Range of Possible Values	Potential impact on the risk conclusions
Fraction of produce consumed from the site	10%	0 – 100%	It has been assumed in the HHRA that people in the school community may consume up to 10% of their dietary fresh produce from the site. This is in line with assumptions in the ASC NEPM about the fraction of produce that residents may consume from their gardens. The size of vegetables gardens and the number of chickens that may be housed at the site in the future is currently unclear, therefore a conservative approach to consumption of produce from the site was adopted. Assuming a lower proportion of home grown produce is consumed from the site results in a lower estimate of risks, however, would not result in a change in the conclusions of the HHRA.

Exposure Parameter	Value Adopted in HHRA	Range of Possible Values	Potential impact on the risk conclusions
Fraction of food obtained from the site - chickens	1	0-1	It has been assumed that 100% of the food consumed by chickens that may be housed at the site would be sourced from plants grown at the site. It is understood that where chickens are kept at the site, their diet is likely to be supplemented by either grains or food scraps sourced from off-site or commercial suppliers. However, as this is a theoretical future scenario, it is unclear what proportion of food the chickens would obtain from the site, and what would be supplemented from commercial grains or food scraps. In addition, as soil invertebrates have not been sampled at the site it is unclear what concentrations would be present in soil invertebrates consumed by chickens. Adopting a lower proportion of food/plants obtained from the site would reduce the risk estimate. However, a change in this assumption on its own would not change the HHRA conclusions with regard to this exposure scenario.

Exposure Parameter	Value Adopted in HHRA	Range of Possible Values	Potential impact on the risk conclusions
Cumulative result of adjusting the above factors on the risk outcomes			If each of the above listed variables were reduced to assume reasonable average exposures (e.g. soil EPC = 0.79 mg/kg; produce consumed from the site = 5%; and chicken feed obtained from the site = 50%) the risk estimates would be reduced, however, the HHRA conclusions would remain the same. The adoption of a number of conservative exposure assumptions may result in overestimation of risks to receptors as a result of exposure to PFOS, PFHxS and PFOA. However, it is known that there are a range of PFAS compounds for which either no toxicity data is available, or no laboratory analysis can be undertaken at this time. Therefore, it is considered appropriate to adopt conservative assumptions, especially where adopting less conservative assumptions is unlikely to change the risk conclusions.

7.2.4 Risk Evaluation

The quantification of risks to human health presented in this report has considered a range of issues that are associated with uncertainties inherent in the site-specific data, toxicological data and assumptions adopted. A number of these uncertainties and issues warrant consideration in the interpretation of the risk estimates. These include:

» The data limitations identified to impact on the outcomes of the risk assessment. It is noted that although data limitations exist, none of the identified data limitations are considered to result in significant uncertainty in the risk assessment and therefore the risk estimates are considered appropriate with consideration of these data limitations.

» Where a number of conservative assumptions are adopted during risk modelling there is potential to over-estimation of exposures. However, there is also potential for assumptions to result in underestimation of exposures. This is further evaluated in the uncertainty assessment (**Section 7.2.5**). The outcomes of the uncertainty assessment indicate that the assumptions adopted in the current risk assessment are appropriate for the level of exposure likely to occur at and surrounding the site.

As noted in **Section 5.3**, there are a range of PFAS reported in soil, groundwater and surface water for which no toxicity values are available. Therefore PFOS, PFOA, PFHxS and PFHxA have been used as indicator compounds to assess risks to identified receptors. Based on the data presented in **Section 5.3**, these four compounds make up over 50% of the PFAS concentrations in all environmental media sampled.

The estimated HI for all receptors, excluding potential future chicken egg consumption, assessed in the HHRA, based on a set of reasonable maximum exposure assumptions, provides a margin of safety of greater than 0.5 (>50% of the target HI of 1) therefore it is considered reasonable to assume that total PFAS exposures for identified receptors assessed herein are likely to be low and acceptable in both on-site and off-site areas under current land use conditions. Evaluation of future chicken egg consumptions indicates that there is potential for unacceptable risks if eggs collected from chickens raised within the investigation area of the site were consumed in the future.

7.2.5 Uncertainty Assessment

The interpretation of risks to human receptors of the site must take into consideration the uncertainty in the data and the data limitations identified (**Section 4.4**). **Table 14** presents a summary of the uncertainties in the HHRA and the likely impact on the outcomes of this assessment.

Table 14: Summary of Key Uncertainties

Source of Uncertainty	Likely Impact on the HHRA Outcomes
Limited number of surface water (temporal sampling) and biota samples.	The maximum reported PFAS concentrations in soil and surface water have been adopted herein to estimate potential exposures. In addition, the maximum reported soil concentrations have been used to model potential uptake into chicken eggs and plants. These adopted reasonable maximum assumptions are considered likely to overestimate risks associated with PFAS exposure, and therefore provide a reasonable margin of safety in the risk outcomes.
Exposure frequency and exposure time assumptions	A number of assumptions have been made about the amount of time receptors may be exposed to site-derived PFAS in on-site and off-site areas. Assumptions have also been adopted with regard to the frequency of exposure. The exposure assumptions have generally been adopted to represent reasonable average exposures. However, there is potential for a small proportion of people to be exposed more or less frequently than assumed. Overall the exposure parameters are considered to result in the potential for overestimation of risks to the majority of receptors.

8. Ecological Risk Assessment

The following sections provide details of the assessments undertaken to characterise the potential for unacceptable risks to ecological receptors which may inhabit the site and surrounding environments.

8.1 Ecological Site Setting

The site itself contains areas of highly modified gardens and open grassed spaces designed to enable the children that attend OLOL to play during break times and undertake gardening activities as part of the school curriculum. As such, the site provides very limited natural habitat for native flora and fauna.

The area directly surrounding the site consists of roadways and residential and commercial properties. A number of the residential properties have large garden areas that are used as open grassed spaces or for maintained garden beds that contain either ornamental plants or home grown produce. These highly modified environments contain limited habitat for native flora and fauna.

The site is located approximately 130 m from the south eastern corner of Tarro Reserve, this reserve area consists of maintained sporting fields, open grassed spaces and a freshwater waterbody that is used primarily as a stormwater retention facility where stormwater from the area discharges during storm events. This area provides a limited amount of terrestrial habitat for native flora and fauna. However, the waterbody provides habitat for aquatic biota and birds (e.g. ducks, ibis and other wading birds) that forage on aquatic plants and animals.

As outlined in **Section 5.1.4**, a disturbed ephemeral freshwater wetland area, locally referred to as Tarro Swamp, is located approximately 500 m north of the site (to the north of Tarro Reserve and the stormwater retention lake). It is understood that this wetland area drains to a small waterway called Purgatory Creek approximately 800 m from the site. Purgatory Creek discharges to the Hunter River approximately 2 km east of the site.

The Hunter River flows into the Hunter Estuary Wetlands Ramsar site located approximately 3.5 km south-east of the site. The Hunter Estuary Wetlands provide an abundance of habitat and foraging opportunities of local and migratory birds.

A search of the Environment Protection and Biodiversity Conservation (EPBC) Act protected matters report (using the Protected Matters Search Tool (PMST)), with a 5 km buffer around the site identified the following:

- One wetland of international importance (located within the Hunter Estuary Wetlands Ramsar site);
- Four threatened ecological communities (Central Hunter Valley eucalypt forest and woodland; Coastal Swamp Oak Forest of NSW and SE QLD; Lowland Rainforest; and Subtropical and Temperate Coastal Saltmarsh);
- 65 threatened species; and
- 55 migratory species.

Based on the information provided in the PMST report (**Appendix C**), and information downloaded from the Atlas of Living Australia (https://spatial.ala.org.au/#) it is considered likely that the majority of species that inhabit the site and surrounding areas are urban waterbird species such as Ibis, duck species (e.g. Pacific Black Duck, Wandering Whistling Duck, Australian Wood Duck) and Heron. A number of terrestrial birds (e.g. Myna bird species, Cockatoo, parrot and lorikeet species) and birds of prey (e.g. Kite species, Goshawks, Falcon) have been sighted in the area, however it is considered likely that these species have a large foraging range due to the limited natural habitat for prey species found in the area directly surrounding the site and within Tarro Reserve. Terrestrial and aquatic species have also been reported to be present (e.g.

snake species, frog species and insect species) however these would provide a limited resource for native animals, therefore foraging would need to occur over a wide range in the area surrounding the site. Data obtained from Atlas of Living Australia (https://spatial.ala.org.au/#) and observations and information gathered during the DSI supports the assumption that it is unlikely that any of the threatened ecological communities are present within a 1 km radius of the site. In addition, due to the highly modified nature of the site and the area surrounding the site, it is considered unlikely that significant habitat for any of the threatened or migratory species would be present at the site or within nearby areas.

8.2 Exposure Assessment

Based on the above outlined ecological setting for the site, the following ecological receptors are considered to have the potential to be exposed to site-derived PFAS impacts in environmental media:

» Transient wildlife that visit the site and adjacent nature strip areas to forage;

» Ecological receptors that inhabit or forage within residential gardens surrounding the site; and

» Ecological receptors that inhabit or forage within Tarro Reserve.

As noted in **Section 8.1**, there is considered to be limited habitat to support native flora and fauna at the site and within surrounding residential gardens, therefore the key focus of the ecological risk assessment has been on the wildlife that may inhabit or forage within Tarro Reserve, specifically the aquatic habitat areas within Tarro Reserve.

8.3 Tier 1 Screening Assessment

In order to identify the potential for unacceptable ecological risks, the reported PFAS concentrations in environmental media were screened against generic Tier 1 screening criteria as outlined in **Section 6.2.1.2**. The outcomes of the Tier 1 screening identified the following:

» **Soil** – exceedances of the public open space screening criteria for surficial soils in on-site areas only, no exceedances of the public open space screening criteria in off-site locations (nature strips).

» **Surface Water** – exceedances of the 99% species protection screening value in samples collected on-site and off-site, and exceedance of 95% species protection screening value on-site and in one off-site sample. The one off-site sample that exceeded the 95% species protection value was from stormwater runoff in an earthen stormwater drainage channel. Surface water samples collected to date from within the permanent water body within Tarro Reserve reported PFAS concentrations below the adopted 95% species protection screening value.

» **Home-grown produce (on-site only)** – PFOS and PFOA were not detected in any of the five produce samples collected from on-site.

The presence of PFAS at concentrations above adopted Tier 1 ecological screening values in environmental media in both on-site and off-site areas indicates that there is a potential for bioaccumulation to be occurring within the local food chain, and therefore for increased risks to ecological receptors that may inhabit or forage within the area on and surrounding the site.

8.4 Qualitative Risk Evaluation

To further evaluate the potential for unacceptable risks to ecological receptors, the assumptions adopted during the derivation of the Tier 1 screening values have been further evaluated. The relevance of these assumptions to the conditions at the site and in surrounding off-site areas, and whether any site-specific adjustments may be applied, has been assessed (**Table 15**).

Review of the assumptions adopted by regulatory agencies during Tier 1 screening criteria derivation identified that there is considerable uncertainty inherent in the assumptions adopted (refer to details provided in **Table 15**). It is therefore difficult to determine a) whether these assumptions are applicable to the site and surrounding areas, and b) whether there is potential for site-specific adjustments to be applied. It was therefore concluded that no adjustments should be applied to Tier 1 screening values given the limited nature of the available data for the site and the uncertainties in the screening values.

Table 15: Evaluation of Tier 1 Screening Criteria Derivation

Compound	Tier 1 Screening Criteria	Basis of the Screening Criteria	Relevance to Site Ecological Setting
Soil (mg/kg)			
PFOS	1	Due to a lack of data available at the time of preparation of the PFAS NEMP it was decided that the human health screening criteria for public open space would be adopted as an interim value.	As the derivation of this screening criteria is not based on exposures for ecological receptors it is difficult to determine whether this value is appropriate for screening at the site and in surrounding areas. It is noted that this screening criteria was only exceeded in a limited number of surficial soil samples on-site and no exceedances were identified in off-site areas.
	0.01	The screening criteria is based on dietary exposure to PFAS for secondary consumers (animals that primarily consume insects).	The PFAS NEMP states that 'for intensively developed sites with no secondary consumers and minimal potential for indirect ecological exposure, a higher criterion of up to 0.14 mg/kg may be appropriate. It is noted that there is potential for secondary consumers (primarily birds) to forage in the garden areas of the site, along the nature strips adjacent to the site and within the drainage channels that carry stormwater from the site to the waterbody within Tarro Reserve. Therefore, the more conservative value of 0.01 has been adopted herein.
	2.2	This screening criteria assumes small mammals (body weight = 0.035 kg) will be present at a site that would consume plants as their primary food source, and that incidental	It is considered unlikely that small native mammals would be present at the site and in the surrounding residential areas due to a lack of suitable habitat for these receptors. In addition, the habitat present within Tarro Reserve is limited and therefore is unlikely to

Compound	Tier 1 Screening Criteria	Basis of the Screening Criteria	Relevance to Site Ecological Setting
		ingestion of soils impacted with PFAS would occur during foraging.	support a population of small plant eating mammals. The screening criteria derived by ECCC (2017) for small plant eating birds (5.1 mg/kg) may be more appropriate as there is increased potential for small plant eating birds to forage at the site and in surrounding areas. However, as with the mammals, the habitat is limited and therefore such birds would need to forage over large areas to gather sufficient food to sustain them. Screening of reported soil concentrations using the 5.1 mg/kg screening criteria (refer to **Table T1**) indicates that risks are low and acceptable for small plant eating birds that may access the site.
PFOA	10	Due to a lack of data available at the time of preparation of the PFAS NEMP it was decided that the human health screening criteria for public open space would be adopted as an interim value.	As the derivation of this screening criteria is not based on exposures for ecological receptors it is difficult to determine whether this value is appropriate for screening at the site and in surrounding areas. It is noted that no exceedances of this screening criteria were identified in on-site or off-site samples.
Surface Water (µg/L)			
PFOS	0.00023 (99% species protection) 0.13 (95% species protection)	These screening criteria have been derived using the method outlined in ANZG (2018), and are based on a limited freshwater toxicity dataset that contains a wide range of toxicity values. The 99% species protection value is driven by the inclusion of a single fish toxicity study with a toxicity value that was an order of magnitude below all other toxicity values adopted in the screening criteria derivation.	These screening criteria provide an indication of the potential for unacceptable risks to aquatic receptors. However, given the limited number of suitable freshwater toxicity studies available to date and the considerable variability in the dataset, it is not considered appropriate to adjust these values for site-specific conditions.

Compound	Tier 1 Screening Criteria	Basis of the Screening Criteria	Relevance to Site Ecological Setting
PFOA	19 220	These screening criteria have been derived using the method outlined in ANZG (2018) and are based on a limited freshwater toxicity dataset that contains a wide range of toxicity values.	

8.5 Ecological Risk Characterisation

Given the uncertainty inherent in the Tier 1 screening values and the available data, it was considered appropriate to evaluate the potential for risks to ecological receptors using a qualitative approach whereby multiple lines of evidence are considered as part of an overall weight of evidence. The approach enables an evaluation of the available data, provides an overall picture of the potential for unacceptable risks and enables identification of the key risk driving factors that may inform future management measures.

Table 16: Weight of Evidence Evaluation

Risk Evaluation Question	Line of Evidence	Weight of Evidence
Is there a mechanism for site-derived impacts to migrate away from the main source area and reach ecological habitats (terrestrial and/or aquatic)?	Former fire training activities conducted at the site have been identified to have resulted in PFAS impacts in surficial soils at the site. In addition, it is considered likely that spray drift and/or surface water run-off resulting from fire training may have impacted nearby environments. This is supported by the detection of PFAS in surficial soils within the nature strip environments adjacent to and surrounding the site. PFAS has been reported at concentrations above laboratory limits of reporting in surficial soils on-site, in adjacent nature strip areas, within the stormwater drainage system and within surface water in Tarro Reserve and Tarro Swamp. PFAS has been detected in groundwater beneath the site. Therefore, PFAS impacts are likely to be transported away from the site in groundwater.	Yes – the available evidence suggests that there are multiple transport pathways for PFAS to migrate away from the site and into terrestrial and aquatic habitats on and surrounding the site. The key transport pathway, based on the available data, is considered to be leaching from soil to surface water run-off and discharge of surface water run-off via the local stormwater system to the waterway within Tarro Reserve.

Risk Evaluation Question	Line of Evidence	Weight of Evidence
Are site-derived impacts reported at concentrations above adopted Tier 1 screening values?	As outlined in **Section 8.3** samples of soil and surface water collected from on-site and off-site locations have been reported to contain PFOS at concentrations above the adopted Tier 1 screening values.	Yes – exceedances of Tier 1 screening values for 99% species protection in surface water samples collected from off-site. A single exceedance of the 95% species protection value was reported in a surface water sample collected from an earthen drainage channel within Tarro Reserve, however no other exceedances of the 95% species protection value were reported in surface water samples collected from off-site areas. Off-site soil samples were reported to contain PFAS at concentrations below the public open space screening value, indicating low potential risks to terrestrial receptors as a result of direct toxicity.
Do site-derived impacts have the potential to bioaccumulate?	The scientific literature with regard to PFAS shows that some compounds are more bioaccumulative than others. The biota samples collected from the raised vegetable garden at the site were not reported to contain detectable concentrations of PFOS, PFOA, PFHxS and PFHxA, however minor detectable concentrations of other PFAS were reported in these samples (refer to **Table T3**).	Yes – PFAS have been demonstrated to bioaccumulate in plants and animals
Is there habitat present on-site and in surrounding areas that supports native flora and fauna?	As outlined in **Section 8.1** there is limited habitat for native flora and fauna in both on-site and off-site areas. Therefore, the primary ecological populations in the area are likely to consist of more resilient urban species (for example: pigeons, duck, ibis etc.).	Limited – there is minimal habitat to support native flora and fauna populations on-site and in off-site areas.

Risk Evaluation Question	Line of Evidence	Weight of Evidence
Are native flora and fauna populations in the area likely to be impacted by the presence of site-derived impacts?	Given the highly urbanised environment of the site and surrounding area it is considered likely that habitat loss and fragmentation have impacted on sensitive native flora and fauna species. It is therefore difficult to determine whether the presence of PFAS in the environmental media would also be causing population level impacts.	Unlikely – given the highly modified nature of the on-site and off-site environments it is difficult to determine whether site-derived impacts are negatively affecting ecological populations.
Are higher order ecological receptors (predatory birds and mammals) likely to be impacted by site-derived impacts?	The reported presence of PFAS in soil and surface water is such that the ecological species that are present (plants and aquatic biota) are likely to be bioaccumulating PFAS. Where predatory species (e.g. fish-eating birds) may be accessing these areas there is potential for them to be exposed to PFAS at higher concentrations than are present in the environment.	Possibly – given the presence of PFAS in surface water at Tarro Reserve it is considered possible that fish eating birds and mammals may be exposed to PFAS as a result of foraging within Tarro Reserve water bodies.

Weight of evidence

Overall, the weight of evidence suggests that:

» There is limited habitat available for native flora and fauna in both on-site and off-site locations, therefore ecological populations are considered likely to consist primarily of more resilient urban species (e.g. Ibis);
» The ecological populations that are present (especially those that forage on-site and within Tarro Reserve) are likely to be exposed to site-derived impacts;
» There is potential for bioaccumulation to be occurring in local ecological populations; and
» There is potential for PFAS exposures to be posing an unacceptable risk to ecological receptors in some off-site areas (primarily the earthen drains within Tarro Reserve) based on reported exceedances of Tier 1 screening values.

9. Conclusions and Recommendations

On the basis of the available data and the assessment presented herein, and with consideration of identified uncertainties and data limitations the following conclusions are presented:

- Risks of exposure to PFAS to adults and children that attend OLOL Primary School, and who may consume home grown produce grown on the site (assumed to consist of up to 10% of their diet of fruits and vegetables) have been estimated to be low and acceptable in accordance with nationally published guidance;
- There is potential for unacceptable risks of exposure to PFAS under future land use conditions where chickens are housed in the DSI investigation area at the site for the purposes of laying eggs for human consumption;
- Risks of exposure to PFAS to residents (adults and children) that inhabit the properties adjacent to the site, and who consume home grown produce (fruits and vegetables) from their gardens, have been estimated to be low and acceptable in accordance with nationally published guidance;
- Risks of exposure to PFAS to recreational receptors that use Tarro Reserve for swimming purposes were estimated to be low and acceptable in accordance with nationally published guidance; and
- Risks of exposure to PFAS to ecological receptors that may forage at the site and in surrounding areas, including within Tarro Reserve, are potentially unacceptable based on comparison of reported concentrations in soil and surface water with Tier 1 screening values. However, given the highly modified nature of the on-site and off-site environments it is considered likely that ecological receptors consist primarily of common urban species that are known to be less sensitive to environmental impacts compared to native species that inhabit less disturbed/modified environments.

Given the above conclusions the following recommendations are provided:

- Given the potential for PFAS uptake to occur into chicken eggs, it is recommended that chickens are not housed within the investigation area of the site. If chickens are housed on-site in the future, it is recommended that soils in the proposed location be tested to confirm that consumption of chicken eggs would not increase the potential for PFAS exposures.
- As a precautionary approach it is recommend that wherever possible vegetable gardens should be within raised garden beds. It is noted that this is consistent with the current approach to produce garden configurations at the site.
- It is recommended that wherever possible, efforts should be made to minimise the potential for PFAS to leach from soils within the source area of the site into groundwater and surface water to minimise the potential for transport of PFAS away from the site.
- An ongoing monitoring program should be implemented to measure on-site and off-site surface water and groundwater concentrations over time. This will allow an assessment of changes in the potential for PFAS transport and will inform potential future risk management decisions.

10. References

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Figures

Figure F1: Site Location

FRNSW - Human Health and Ecological Risk Assessment (Tarro)
NP19039

Legend
Investigation Area

DATA SOURCES
Imagery: Nearmaps, 2019

0 50 100 m

nation partners

Figure F2: Investigation Area

FRNSW - Human Health and Ecological Risk Assessment (Tarro)
NP19039

Legend
Investigation Area

DATA SOURCES
Imagery: Nearmaps, 2019

0 7.5 15 m

nation partners

Figure F3: Soil Sample Locations

FRNSW - Human Health and Ecological Risk Assessment (Tarro)
NP19039

Legend
Investigation Area
Soil Sample Locations
GW Well Soil Samples
Produce Soil Samples

DATA SOURCES
Imagery: Nearmaps, 2019

0 10 20 m

nation partners

Figure F4: Surface Water Sample Locations

FRNSW - Human Health and Ecological Risk Assessment (Tarro)
NP19039

Legend
Investigation Area
Surface Water Samples

DATA SOURCES
Imagery: Nearmaps, 2019

0 100 200 m

nation partners

Figure F5: Produce Sample Locations

FRNSW - Human Health and Ecological Risk Assessment (Tarro)
NP19039

Legend
Investigation Area
Produce Sample Locations

DATA SOURCES
Imagery: Nearmaps, 2019

0 5 10 m

nation partners

Tables

Table T1: Soil Analytical Data

Lab Report Number	Field ID	Date	Matrix Type	Location	PFOS/PFOA																						
					Perfluorodecanoic acid (PFDA)	Perfluorohexanoic acid (PFHxA)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-ethylperfluorooctanesulfonamidoethanol (NEtFOSE)	N-Methyl perfluorooctane sulfonamide (NMeFOSA)	N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	N-Methylperfluorooctanesulfonamidoethanol (N-MeFOSE)	Perfluorononanesulfonic acid (PFNS)(trace)	Perfluorobutane sulfonic acid (PFBS)	Perfluorobutanoic acid (PFBA)	Perfluorodecanesulfonic acid (PFDS)	Perfluorododecanoic acid (PFDoDA)	Perfluoropropanesulfonic acid (PFPrS)	Perfluoroheptane sulfonic acid (PFHpS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)	Perfluorooctane sulfonamide (PFOSA)	Perfluorooctanesulfonic acid (PFOS)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0003	0.0005	0.0005	0.0003
PFAS NEMP 2018 Table 2 Health Public open space																											
PFAS NEMP 2018 Table 2 Health Residential accessible soil																											
Site-specific screening level (Nation Partners, 2019a)																											
ECCC (2017) Primary consumers																											5.1
PFAS NEMP 2018 Table 3 Interim EDE Public open space																											1
PFAS NEMP 2018 Table 3 Interim EIE Residential																											0.01
Lab Report Number	Field ID	Date	Matrix Type	Location																							
678496	S1-0.2	23/9/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	0.0084	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0057	0.14
678496	S2-0.2	23/9/19	soil	on-site	<0.005	0.013	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	0.0058	<0.005	<0.005	<0.005	<0.005	<0.005	0.0061	0.018	0.034	<0.005	0.44
679939	S3 (0.0-0.2)	30/9/19	soil	on-site	<0.005	0.0079	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	<0.005	<0.005	0.037	0.0052	<0.005	2.2
679939	S3 (0.4-0.6)	30/9/19	soil	on-site	<0.005	0.014	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.0073	<0.005	<0.005	<0.005	<0.005	0.0063	<0.005	<0.005	0.063	<0.005	<0.005	0.28
679939	S5 (0.5-0.7)	30/9/19	soil	on-site	<0.005	0.061	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.031	0.0063	<0.005	<0.005	0.01	0.018	<0.005	0.017	0.2	<0.005	<0.005	0.39
679939	S7 (0.0-0.2)	30/9/19	soil	on-site	<0.005	0.01	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.022	<0.005	<0.005	0.47
679939	S7 (0.4-0.6)	30/9/19	soil	on-site	<0.005	0.01	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.03	<0.005	<0.005	0.05
679939	S9 (0.0-0.2)	30/9/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0068	<0.005	<0.005	0.16
680443	S3 (0.2-0.4)	30/9/19	soil	on-site	<0.005	0.015	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.011	<0.005	0.0056	0.054	<0.005	<0.005	0.58
680443	S3 (0.6-0.8)	30/9/19	soil	on-site	<0.005	0.041	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.031	<0.005	<0.005	<0.005	0.0091	0.011	<0.005	0.013	0.18	<0.005	<0.005	0.25
680443	S3 (0.8-1.0)	30/9/19	soil	on-site	<0.005	0.069	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.066	<0.005	<0.005	<0.005	0.021	0.0082	<0.005	0.016	0.23	<0.005	<0.005	0.12
680443	S6 (0.5-0.7)	30/9/19	soil	on-site	<0.005	0.037	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.034	<0.005	<0.005	<0.005	0.011	0.0091	<0.005	0.008	0.19	<0.005	<0.005	0.081
680443	S8 (0.0-0.2)	30/9/19	soil	on-site	<0.005	0.07	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.013	<0.005	<0.005	<0.005	<0.005	0.071	<0.005	0.035	0.32	<0.005	<0.005	0.77
680443	S8 (0.4-0.6)	30/9/19	soil	on-site	<0.005	0.025	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.0083	<0.005	<0.005	<0.005	<0.005	0.0077	<0.005	<0.005	0.04	<0.005	<0.005	0.17
680443	S9 (0.4-0.6)	30/9/19	soil	on-site	<0.005	0.0069	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.022	<0.005	<0.005	0.006
680443	S10 (1.0)	30/9/19	soil	on-site	<0.005	0.046	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.017	0.0056	<0.005	<0.005	0.0063	<0.005	<0.005	0.0052	0.076	<0.005	<0.005	0.023
680443	S11 (0.0-0.2)	30/9/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0063	<0.005	<0.005	0.0097
680443	S11 (0.4-0.6)	30/9/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0071	<0.005	<0.005	<0.005
680443	S19 (0.0-0.2)	30/9/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.02
680443	S19 (0.4-0.6)	30/9/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
680454	S12 (0.0-0.2)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
680454	S12 (0.2-0.4)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
680454	S13 (0.0-0.2)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0066	<0.005	<0.005	0.53
680454	S13 (0.2-0.4)	1/10/19	soil	on-site	<0.005	0.0071	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0069	<0.005	<0.005	0.0092	<0.005	<0.005	0.26
680454	S14 (0.0-0.2)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.15
680454	S14 (0.2-0.4)	1/10/19	soil	on-site	<0.005	0.0067	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0098	<0.005	<0.005	0.19
680454	S15 (0.0-0.2)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.012
680454	S15 (0.2-0.4)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
680454	S16 (0.0-0.2)	1/10/19	soil	on-site	<0.005	0.0098	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	0.016	<0.005	0.0058	0.031	<0.005	<0.005	<0.005	<0.005	<0.005	0.022	0.014	0.011	0.73
680454	S16 (0.2-0.4)	1/10/19	soil	on-site	<0.005	0.018	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	0.0058	<0.005	<0.005	<0.005	<0.005	<0.005	0.0082	0.034	<0.005	<0.005	2.2
680454	S17 (0.0-0.2)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.15
680454	S17 (0.2-0.4)	1/10/19	soil	on-site	<0.005	0.013	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.016	0.0074	<0.005	0.55
680454	S18 (0.0-0.2)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.19
680454	S18 (0.2-0.4)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.21
680454	S20 (0.0-0.2)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.043
680454	S20 (0.2-0.4)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.04
680454	S21 (0.0-0.2)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.013
680454	S21 (0.2-0.4)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.007
680454	S22 (0.0-0.2)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
681409	S16 (0.4-0.6)	1/10/19	soil	on-site	<0.005	0.043	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.0082	0.0077	<0.005	<0.005	<0.005	0.05	<0.005	0.017	0.096	0.009	<0.005	5
681409	S16 (0.8-1.0)	1/10/19	soil	on-site	<0.005	0.14	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.053	0.013	<0.005	<0.005	0.012	0.12	<0.005	0.049	0.6	<0.005	<0.005	0.73
681907	S8 (0.8-1.0)	30/9/19	soil	on-site	<0.005	0.045	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.018	<0.005	<0.005	<0.005	<0.005	0.014	<0.005	0.02	0.15	<0.005	<0.005	0.35
681907	S17 (0.8-1.0)	1/10/19	soil	on-site	<0.005	0.0093	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.034	<0.005	<0.005	0.048
682248	MW01_0.1-0.2	10/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
682248	MW02_1.0-1.2	10/10/19	soil	on-site	<0.005	0.0066	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.012	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.037	<0.005	<0.005	0.011
682248	S16_1.5-1.7	11/10/19	soil	on-site	<0.005	0.11	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.057	0.0053	<0.005	<0.005	0.023	<0.005	<0.005	0.0097	0.16	<0.005	<0.005	<0.005
682248	S16_2.5-2.7	11/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
682248	S23_0.0-0.2	10/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
682248	S27_0.05	11/10/19	concrete	on-site	<0.005	0.073	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.014	0.0068	<0.005	<0.005	0.0076	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

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Table T1: Soil Analytical Data

Lab Report Number	Field ID	Date	Matrix Type	Location																			PFOS/PFOA					
					Perfluorodecanoic acid (PFDA)	Perfluorohexanoic acid (PFHxA)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-ethylperfluorooctanesulfonamidoethanol (NEtFOSE)	N-Methyl perfluorooctane sulfonamide (NMeFOSA)	N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	N-Methylperfluorooctanesulfonamidoethanol (N-MeFOSE)	Perfluorononanesulfonic acid (PFNS)(trace)	Perfluorobutane sulfonic acid (PFBS)	Perfluorobutanoic acid (PFBA)	Perfluorodecanesulfonic acid (PFDS)	Perfluorododecanoic acid (PFDoDA)	Perfluoropropanesulfonic acid (PFPrS)	Perfluoroheptane sulfonic acid (PFHpS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)	Perfluorooctane sulfonamide (PFOSA)	Perfluorooctanesulfonic acid (PFOS)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0003	0.0005	0.0005	0.0003
PFAS NEMP 2018 Table 2 Health Public open space																											
PFAS NEMP 2018 Table 2 Health Residential accessible soil																											
Site-specific screening level (Nation Partners, 2019a)																											
ECCC (2017) Primary consumers																											5.1
PFAS NEMP 2018 Table 3 Interim EDE Public open space																											1
PFAS NEMP 2018 Table 3 Interim EIE Residential																											0.01
685397	S9 (0.8-1.0)	30/9/19	soil	on-site	<0.005	0.011	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.0066	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.048	<0.005	<0.005	0.0059
685397	S11 (0.8-1.0)	30/9/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
685397	S12 (0.8-1.0)	30/9/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
685397	S13 (0.4-0.6)	30/9/19	soil	on-site	<0.005	0.019	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.013	<0.005	0.015	0.086	<0.005	<0.005	0.088
685397	S13 (0.8-1.0)	30/9/19	soil	on-site	<0.005	0.063	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.015	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.015	0.11	<0.005	<0.005	0.017
685397	S19 (0.8-1.0)	30/9/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
697518	SD02	17/1/20	sediment	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
697518	SD05	17/1/20	sediment	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0054
698668	S28(0.0-0.2)	22/1/20	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.062
698668	S28(0.2-0.4)	22/1/20	soil	on-site	<0.005	0.02	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	0.0062	<0.005	<0.005	<0.005	<0.005	<0.005	0.027	0.034	<0.005	<0.005	0.18
698668	S29(0.0-0.2)	22/1/20	soil	on-site	<0.005	0.02	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	0.034	0.011	<0.005	0.018	<0.005	<0.005	0.012	<0.005	<0.005	0.062	<0.005	<0.005	1.4
698668	S29(0.2-0.4)	22/1/20	soil	on-site	<0.005	0.014	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	0.0089	0.0091	<0.005	<0.005	<0.005	<0.005	0.0068	<0.005	<0.005	0.037	<0.005	<0.005	0.8
698668	S30(0.0-0.2)	22/1/20	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0095	<0.005	<0.005	0.34
698668	S30(0.2-0.4)	22/1/20	soil	on-site	<0.005	0.01	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.013	<0.005	0.0067	0.042	<0.005	<0.005	0.53
698668	S31(0.0-0.2)	22/1/20	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.031
698668	S31(0.2-0.4)	22/1/20	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
698668	S32(0.0-0.2)	22/1/20	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0084	<0.005	<0.005	0.021	<0.005	<0.005	0.98
698668	S32(0.2-0.4)	22/1/20	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0081	<0.005	<0.005	0.024	<0.005	<0.005	0.92
698668	S33(0.0-0.2)	22/1/20	soil	on-site	<0.005	0.025	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.01	<0.005	<0.005	<0.005	<0.005	0.1	<0.005	0.009	0.15	<0.005	<0.005	2.5
698668	S33(0.2-0.4)	22/1/20	soil	on-site	<0.005	0.014	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	0.014	0.015	<0.005	<0.005	<0.005	0.005	0.021	<0.005	<0.005	0.11	<0.005	<0.005	2.4
700221	S29(0.4-0.6)	22/1/20	soil	on-site	<0.005	0.056	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.022	<0.005	<0.005	<0.005	0.0061	0.062	<0.005	0.018	0.22	0.035	<0.005	0.99
700221	S30(0.4-0.6)	22/1/20	soil	on-site	<0.005	0.012	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.015	<0.005	0.0072	0.053	<0.005	<0.005	0.49
700221	S33A(0.6-0.8)	22/1/20	soil	on-site	<0.005	0.059	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.049	<0.005	<0.005	<0.005	0.02	0.055	<0.005	0.016	0.45	<0.005	<0.005	0.69
701333	S29(0.6-0.8)	22/1/20	soil	on-site	<0.005	0.077	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.059	<0.005	<0.005	<0.005	0.011	0.018	<0.005	0.034	0.38	0.0053	<0.005	0.64
701333	S29(0.8-1.0)	22/1/20	soil	on-site	<0.005	0.05	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.048	<0.005	<0.005	<0.005	0.0099	0.011	<0.005	0.017	0.17	<0.005	<0.005	0.22
701333	S30(0.6-0.8)	22/1/20	soil	on-site	<0.005	0.0096	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0058	<0.005	0.0059	0.055	<0.005	<0.005	0.38
703149	FP1_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0064
703149	FP2_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.047
703149	FP3_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.018
703149	FP4_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0069
703149	FP5_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.021
703149	FP6_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.025
703149	FP7_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	0.012	<0.005	<0.005	0.019	<0.005	<0.005	<0.005	<0.005	<0.005	0.0087	<0.005	<0.005	0.11
703149	FP8_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.14
703149	FP9_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.033
703149	FP10_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.15
703149	FP11_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.02
703149	FP12_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
703149	FP13_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
703149	FP14_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
703149	FP15_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
703149	FP16_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
703149	S16A_0.2-0.4	19/2/20	soil	on-site	<0.005	0.03	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	0.015	0.0058	0.0079	<0.005	<0.005	<0.005	0.0098	<0.005	0.015	0.063	0.018	<0.005	2.2
703149	S16A_0.4-0.6	19/2/20	soil	on-site	<0.005	0.032	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	0.0074	0.0082	0.0078	<0.005	<0.005	<0.005	0.011	<0.005	0.013	0.052	0.018	<0.005	1.9
703149	S16B_0.2-0.4	19/2/20	soil	on-site	<0.005	0.016	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	0.017	<0.005	0.0066	0.018	<0.005	<0.005	<0.005	<0.005	0.0076	0.02	0.0097	<0.005	0.58
703149	S16B_0.4-0.6	19/2/20	soil	on-site	<0.005	0.017	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	0.0062	<0.005	<0.005	<0.005	<0.005	<0.005	0.0095	0.022	0.0059	<0.005	0.61
703149	S16C_0.2-0.4	19/2/20	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0058	0.0065	<0.005	0.17
703149	S16C_0.4-0.6	19/2/20	soil	on-site	<0.005	0.011	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0058	0.0098	0.0052	<0.005	0.15
703149	S34_0.0-0.2	19/2/20	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.38
703149	S34_0.2-0.4	19/2/20	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0055	<0.005	<0.005	0.27
703149	TARRO_PIT 1	20/2/20	sediment	on-site	<0.005	<0.005	<0.005	<0.005	0.0052	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.016
703149	TARRO_PIT 2	20/2/20	sediment	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.034

Table T1: Soil Analytical Data

Lab Report Number	Field ID	Date	Matrix Type	Location	Perfluoropentane sulfonic acid (PFPeS)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	Sum of PFAS	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	Perfluorooctanoic acid (PFOA)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0003
PFAS NEMP 2018 Table 2 Health Public open space													1			10
PFAS NEMP 2018 Table 2 Health Residential accessible soil													0.009			0.1
Site-specific screening level (Nation Partners, 2019a)													1.67			13.35
ECCC (2017) Primary consumers																
PFAS NEMP 2018 Table 3 Interim EDE Public open space																10
PFAS NEMP 2018 Table 3 Interim EIE Residential																
678496	S1-0.2	23/9/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.14	0.1541	0.14	0.14	0.14	<0.01	<0.005
678496	S2-0.2	23/9/19	soil	on-site	<0.005	0.029	<0.005	<0.005	<0.005	0.458	0.5459	0.5119	0.458	0.44	<0.01	<0.005
679939	S3 (0.0-0.2)	30/9/19	soil	on-site	0.0091	0.0073	<0.005	<0.005	<0.005	2.2468	2.2863	2.262	2.237	2.2098	<0.01	0.0098
679939	S3 (0.4-0.6)	30/9/19	soil	on-site	0.0094	0.0083	<0.005	<0.005	<0.005	0.3509	0.3962	0.3805	0.343	0.2879	<0.01	0.0079
679939	S5 (0.5-0.7)	30/9/19	soil	on-site	0.041	0.041	<0.005	<0.005	<0.005	0.623	0.8643	0.7953	0.59	0.423	0.016	0.033
679939	S7 (0.0-0.2)	30/9/19	soil	on-site	<0.005	0.014	<0.005	<0.005	<0.005	0.504	0.528	0.528	0.492	0.482	<0.01	0.012
679939	S7 (0.4-0.6)	30/9/19	soil	on-site	<0.005	0.0066	<0.005	<0.005	<0.005	0.08	0.0966	0.0966	0.08	0.05	<0.01	<0.005
679939	S9 (0.0-0.2)	30/9/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.1668	0.1668	0.1668	0.1668	0.16	<0.01	<0.005
680443	S3 (0.2-0.4)	30/9/19	soil	on-site	0.0063	0.011	<0.005	<0.005	<0.005	0.653	0.7019	0.6846	0.634	0.599	<0.01	0.019
680443	S3 (0.6-0.8)	30/9/19	soil	on-site	0.041	0.018	<0.005	<0.005	<0.005	0.445	0.6091	0.548	0.43	0.265	<0.01	0.015
680443	S3 (0.8-1.0)	30/9/19	soil	on-site	0.075	0.03	<0.005	<0.005	<0.005	0.361	0.6462	0.542	0.35	0.131	<0.01	0.011
680443	S6 (0.5-0.7)	30/9/19	soil	on-site	0.033	0.0071	<0.005	<0.005	<0.005	0.2791	0.4183	0.3652	0.271	0.0891	<0.01	0.0081
680443	S8 (0.0-0.2)	30/9/19	soil	on-site	0.039	0.014	<0.005	<0.005	<0.005	1.168	1.466	1.356	1.09	0.848	0.056	0.078
680443	S8 (0.4-0.6)	30/9/19	soil	on-site	0.0085	0.0072	<0.005	<0.005	<0.005	0.218	0.2747	0.2585	0.21	0.178	<0.01	0.008
680443	S9 (0.4-0.6)	30/9/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.028	<0.05	0.0349	0.028	0.006	<0.01	<0.005
680443	S10 (1.0)	30/9/19	soil	on-site	0.014	0.08	<0.005	<0.005	<0.005	0.099	0.2731	0.2528	0.099	0.023	<0.01	<0.005
680443	S11 (0.0-0.2)	30/9/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.016	<0.05	0.016	0.016	0.0097	<0.01	<0.005
680443	S11 (0.4-0.6)	30/9/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.0071	<0.05	<0.01	0.0071	<0.005	<0.01	<0.005
680443	S19 (0.0-0.2)	30/9/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.02	<0.05	0.02	0.02	0.02	<0.01	<0.005
680443	S19 (0.4-0.6)	30/9/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
680454	S12 (0.0-0.2)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
680454	S12 (0.2-0.4)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
680454	S13 (0.0-0.2)	1/10/19	soil	on-site	<0.005	0.01	<0.005	<0.005	<0.005	0.5366	0.5466	0.5466	0.5366	0.53	<0.01	<0.005
680454	S13 (0.2-0.4)	1/10/19	soil	on-site	<0.005	0.014	<0.005	<0.005	<0.005	0.2769	0.3049	0.298	0.2692	0.2677	<0.01	0.0077
680454	S14 (0.0-0.2)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.15	0.15	0.15	0.15	0.15	<0.01	<0.005
680454	S14 (0.2-0.4)	1/10/19	soil	on-site	<0.005	0.009	<0.005	<0.005	<0.005	0.2066	0.2223	0.2223	0.1998	0.1968	<0.01	0.0068
680454	S15 (0.0-0.2)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.012	<0.05	0.012	0.012	0.012	<0.01	<0.005
680454	S15 (0.2-0.4)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
680454	S16 (0.0-0.2)	1/10/19	soil	on-site	<0.005	0.021	<0.005	<0.005	0.0069	0.757	0.8725	0.7936	0.752	0.735	<0.01	0.005
680454	S16 (0.2-0.4)	1/10/19	soil	on-site	<0.005	0.024	<0.005	<0.005	<0.005	2.244	2.3	2.3	2.234	2.21	<0.01	0.01
680454	S17 (0.0-0.2)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.15	0.15	0.15	0.15	0.15	<0.01	<0.005
680454	S17 (0.2-0.4)	1/10/19	soil	on-site	<0.005	0.011	<0.005	<0.005	<0.005	0.577	0.6084	0.601	0.566	0.561	<0.01	0.011
680454	S18 (0.0-0.2)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.19	0.19	0.19	0.19	0.19	<0.01	<0.005
680454	S18 (0.2-0.4)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.21	0.21	0.21	0.21	0.21	<0.01	<0.005
680454	S20 (0.0-0.2)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.043	<0.05	0.043	0.043	0.043	<0.01	<0.005
680454	S20 (0.2-0.4)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.04	<0.05	0.04	0.04	0.04	<0.01	<0.005
680454	S21 (0.0-0.2)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.013	<0.05	0.013	0.013	0.013	<0.01	<0.005
680454	S21 (0.2-0.4)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	<0.05	<0.01	0.007	0.007	<0.01	<0.005
680454	S22 (0.0-0.2)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
681409	S16 (0.4-0.6)	1/10/19	soil	on-site	0.014	0.051	<0.005	<0.005	<0.005	5.136	5.3359	5.2629	5.096	5.04	<0.01	0.04
681409	S16 (0.8-1.0)	1/10/19	soil	on-site	0.067	0.11	<0.005	<0.005	<0.005	1.49	2.081	1.882	1.33	0.89	0.027	0.16
681907	S8 (0.8-1.0)	30/9/19	soil	on-site	0.024	0.013	<0.005	<0.005	<0.005	0.516	0.65	0.612	0.5	0.366	<0.01	0.016
681907	S17 (0.8-1.0)	1/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.082	0.0913	0.0913	0.082	0.048	<0.01	<0.005
682248	MW01_0.1-0.2	10/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
682248	MW02_1.0-1.2	10/10/19	soil	on-site	0.009	<0.005	<0.005	<0.005	<0.005	0.048	0.0756	0.0666	0.048	0.011	<0.01	<0.005
682248	S16_1.5-1.7	11/10/19	soil	on-site	0.044	0.024	<0.005	<0.005	<0.005	0.16	0.433	0.366	0.16	<0.005	<0.01	<0.005
682248	S16_2.5-2.7	11/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
682248	S23_0.0-0.2	10/10/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
682248	S27_0.05	11/10/19	concrete	on-site	0.0062	0.014	<0.005	<0.005	<0.005	<0.005	0.1216	0.1078	<0.005	<0.005	<0.01	<0.005

Table T1: Soil Analytical Data

Lab Report Number	Field ID	Date	Matrix Type	Location	Perfluoropentane sulfonic acid (PFPeS)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	Sum of PFAS	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	Perfluorooctanoic acid (PFOA)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0003
PFAS NEMP 2018 Table 2 Health Public open space													1			10
PFAS NEMP 2018 Table 2 Health Residential accessible soil													0.009			0.1
Site-specific screening level (Nation Partners, 2019a)													1.67			13.35
ECCC (2017) Primary consumers																
PFAS NEMP 2018 Table 3 Interim EDE Public open space																10
PFAS NEMP 2018 Table 3 Interim EIE Residential																
685397	S9 (0.8-1.0)	30/9/19	soil	on-site	0.0055	<0.005	<0.005	<0.005	<0.005	0.0539	0.077	0.0715	0.0539	0.0059	<0.01	<0.005
685397	S11 (0.8-1.0)	30/9/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
685397	S12 (0.8-1.0)	30/9/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
685397	S13 (0.4-0.6)	30/9/19	soil	on-site	<0.005	0.023	<0.005	<0.005	<0.005	0.22	0.29	0.277	0.174	0.134	<0.01	0.046
685397	S13 (0.8-1.0)	30/9/19	soil	on-site	0.018	0.048	<0.005	<0.005	<0.005	0.127	0.286	0.268	0.127	0.017	<0.01	<0.005
685397	S19 (0.8-1.0)	30/9/19	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
697518	SD02	17/1/20	sediment	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
697518	SD05	17/1/20	sediment	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.0054	<0.05	<0.01	0.0054	0.0054	<0.01	<0.005
698668	S28(0.0-0.2)	22/1/20	soil	on-site	<0.005	0.011	<0.005	<0.005	<0.005	0.062	0.073	0.073	0.062	0.062	<0.01	<0.005
698668	S28(0.2-0.4)	22/1/20	soil	on-site	<0.005	0.027	<0.005	<0.005	<0.005	0.226	0.3062	0.3062	0.214	0.192	<0.01	0.012
698668	S29(0.0-0.2)	22/1/20	soil	on-site	0.0066	0.0099	<0.005	<0.005	<0.005	1.476	1.5875	1.5169	1.462	1.414	<0.01	0.014
698668	S29(0.2-0.4)	22/1/20	soil	on-site	<0.005	0.0057	<0.005	<0.005	<0.005	0.8462	0.8907	0.875	0.837	0.8092	<0.01	0.0092
698668	S30(0.0-0.2)	22/1/20	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.3495	0.3495	0.3495	0.3495	0.34	<0.01	<0.005
698668	S30(0.2-0.4)	22/1/20	soil	on-site	<0.005	0.008	<0.005	<0.005	<0.005	0.597	0.6347	0.6217	0.572	0.555	<0.01	0.025
698668	S31(0.0-0.2)	22/1/20	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.031	<0.05	0.031	0.031	0.031	<0.01	<0.005
698668	S31(0.2-0.4)	22/1/20	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
698668	S32(0.0-0.2)	22/1/20	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	1.001	1.0094	1.001	1.001	0.98	<0.01	<0.005
698668	S32(0.2-0.4)	22/1/20	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.944	0.9521	0.944	0.944	0.92	<0.01	<0.005
698668	S33(0.0-0.2)	22/1/20	soil	on-site	0.0099	0.0064	<0.005	<0.005	<0.005	2.719	2.8793	2.7694	2.65	2.569	<0.01	0.069
698668	S33(0.2-0.4)	22/1/20	soil	on-site	0.0089	<0.005	<0.005	<0.005	<0.005	2.525	2.6029	2.554	2.51	2.415	<0.01	0.015
700221	S29(0.4-0.6)	22/1/20	soil	on-site	0.026	0.014	<0.005	<0.005	<0.005	1.32	1.5591	1.43	1.21	1.1	<0.01	0.11
700221	S30(0.4-0.6)	22/1/20	soil	on-site	<0.005	0.0078	<0.005	<0.005	<0.005	0.57	0.612	0.597	0.543	0.517	<0.01	0.027
700221	S33A(0.6-0.8)	22/1/20	soil	on-site	0.054	0.0078	<0.005	<0.005	<0.005	1.187	1.4478	1.3188	1.14	0.737	<0.01	0.047
701333	S29(0.6-0.8)	22/1/20	soil	on-site	0.059	0.016	<0.005	<0.005	<0.005	1.063	1.3423	1.249	1.02	0.683	<0.01	0.043
701333	S29(0.8-1.0)	22/1/20	soil	on-site	0.039	0.011	<0.005	<0.005	<0.005	0.413	0.5989	0.539	0.39	0.243	<0.01	0.023
701333	S30(0.6-0.8)	22/1/20	soil	on-site	<0.005	0.0051	<0.005	<0.005	<0.005	0.4447	0.4711	0.4653	0.435	0.3897	<0.01	0.0097
703149	FP1_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.0064	<0.05	<0.01	0.0064	0.0064	<0.01	<0.005
703149	FP2_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.047	<0.05	0.047	0.047	0.047	<0.01	<0.005
703149	FP3_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.018	<0.05	0.018	0.018	0.018	<0.01	<0.005
703149	FP4_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.0069	<0.05	<0.01	0.0069	0.0069	<0.01	<0.005
703149	FP5_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.021	<0.05	0.021	0.021	0.021	<0.01	<0.005
703149	FP6_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.025	<0.05	0.025	0.025	0.025	<0.01	<0.005
703149	FP7_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	0.0097	0.1187	0.1594	0.1187	0.1187	0.11	<0.01	<0.005
703149	FP8_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.14	0.14	0.14	0.14	0.14	<0.01	<0.005
703149	FP9_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.033	<0.05	0.033	0.033	0.033	<0.01	<0.005
703149	FP10_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.15	0.15	0.15	0.15	0.15	<0.01	<0.005
703149	FP11_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.02	<0.05	0.02	0.02	0.02	<0.01	<0.005
703149	FP12_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
703149	FP13_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
703149	FP14_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
703149	FP15_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
703149	FP16_0.0-0.2	20/2/20	soil	off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
703149	S16A_0.2-0.4	19/2/20	soil	on-site	0.0058	0.036	<0.005	<0.005	<0.005	2.282	2.4253	2.3767	2.263	2.219	<0.01	0.019
703149	S16A_0.4-0.6	19/2/20	soil	on-site	0.0063	0.04	<0.005	<0.005	<0.005	1.969	2.1127	2.07	1.952	1.917	<0.01	0.017
703149	S16B_0.2-0.4	19/2/20	soil	on-site	<0.005	0.028	<0.005	<0.005	<0.005	0.606	0.7089	0.6642	0.6	0.586	<0.01	0.006
703149	S16B_0.4-0.6	19/2/20	soil	on-site	<0.005	0.03	<0.005	<0.005	<0.005	0.6398	0.7084	0.7025	0.632	0.6178	<0.01	0.0078
703149	S16C_0.2-0.4	19/2/20	soil	on-site	<0.005	0.0056	<0.005	<0.005	<0.005	0.1758	0.1879	0.1814	0.1758	0.17	<0.01	<0.005
703149	S16C_0.4-0.6	19/2/20	soil	on-site	<0.005	0.017	<0.005	<0.005	<0.005	0.1598	0.1988	0.1936	0.1598	0.15	<0.01	<0.005
703149	S34_0.0-0.2	19/2/20	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.38	0.38	0.38	0.38	0.38	<0.01	<0.005
703149	S34_0.2-0.4	19/2/20	soil	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.2755	0.2755	0.2755	0.2755	0.27	<0.01	<0.005
703149	TARRO_PIT 1	20/2/20	sediment	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.016	<0.05	0.016	0.016	0.016	<0.01	<0.005
703149	TARRO_PIT 2	20/2/20	sediment	on-site	<0.005	<0.005	<0.005	<0.005	<0.005	0.034	<0.05	0.034	0.034	0.034	<0.01	<0.005

nation partners

Table T2 - Surface Water Analytical Results

PFOS/PFOA

					Perfluorodecanoic acid (PFDA)	Perfluorohexanoic acid (PFHxA)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-ethylperfluorooctanesulfonamidoethanol (NEtFOSE)	N-Methyl perfluorooctane sulfonamide (NMeFOSA)	N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	N-Methylperfluorooctanesulfonamidoethanol (N-MeFOSE)	Perfluorononanesulfonic acid (PFNS)(trace)	Perfluorobutane sulfonic acid (PFBS)	Perfluorobutanoic acid (PFBA)	Perfluorodecanesulfonic acid (PFDS)	Perfluorododecanoic acid (PFDoDA)	Perfluoropropanesulfonic acid (PFPrS)	Perfluoroheptane sulfonic acid (PFHpS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)	Perfluorooctane sulfonamide (PFOSA)	Perfluorooctanesulfonic acid (PFOS)
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL					0.01	0.01	0.01	0.01	0.05	0.05	0.05	0.05	0.05	0.05	0.01	0.01	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.01
PFAS NEMP 2018 Table 1 Health Drinking Water																											
NHMRC 2019 Health Recreational Water																											
PFAS NEMP 2018 Table 5 Freshwater 95%																											0.13
PFAS NEMP 2018 Table 5 Freshwater 99%																											0.00023
Lab Report Number	**Field ID**	**Date**	**Matrix Type**	**Location**																							
683251	MW01	17/10/19	water	on-site	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.00001	<0.01	<0.01	<0.01	<0.05	<0.01
683251	MW02	17/10/19	water	on-site	<0.01	0.18	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.13	0.10	<0.01	<0.01	0.03	<0.01	<0.00001	0.04	0.38	<0.01	<0.05	0.26
683251	MW03	17/10/19	water	on-site	<0.01	0.03	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.00001	<0.01	0.04	<0.01	<0.05	<0.01
703149	MW01	20/2/20	water	on-site	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
703149	MW02	20/2/20	water	on-site	<0.01	0.11	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.06	0.06	<0.01	<0.01	0.02	<0.01	<0.01	0.02	0.17	<0.01	<0.05	0.09
703149	MW03	20/2/20	water	on-site	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.05	0.02
680454	SW01	1/10/19	water	on-site	<0.01	0.97	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.31	0.38	<0.01	<0.01	0.12	0.08	<0.01	0.26	1.2	0.04	<0.05	2
680454	SW02	1/10/19	water	on-site	<0.01	0.02	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.02	<0.01	<0.05	0.03
697518	SW01	17/1/20	water	on-site	<0.01	0.34	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.09	0.21	<0.01	<0.01	0.03	0.01	<0.01	0.11	0.2	0.02	<0.05	0.44
697518	SW02	17/1/20	water	on-site	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
693205	SW03	12/12/19	water	off-site	<0.01	0.02	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.02	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.06	<0.01	<0.05	0.07
703149	SW03	19/2/20	water	off-site	<0.01	0.02	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.06	<0.01	<0.05	0.08
693205	SW04	12/12/19	water	off-site	<0.01	0.03	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.02	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.06	<0.01	<0.05	0.07
703149	SW04	19/2/20	water	off-site	<0.01	0.02	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.06	<0.01	<0.05	0.08
697518	SW05	17/1/20	water	on-site	<0.01	0.04	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.01	<0.05	0.04
697518	SW06	17/1/20	water	off-site	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	0.03
703149	SW07	19/2/20	water	off-site	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.02	<0.05	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.05	0.02
703149	SW07A	19/2/20	water	off-site	<0.01	0.03	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.07	<0.01	<0.05	0.05
697518	SW08	17/1/20	water	off-site	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	0.01
697518	SW09	17/1/20	water	off-site	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	0.01
708095	SW10	16/3/20	water	off-site	<0.01	0.16	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.06	0.05	<0.01	<0.01	0.02	0.03	<0.01	0.04	0.38	0.02	<0.05	1.2
687690	TANK1	11/11/19	water	on-site	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
703149	TARRO_PIT 1	19/2/20	water	on-site	<0.01	0.05	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.02	<0.05	<0.01	<0.01	0.01	<0.01	<0.01	0.02	0.07	<0.01	<0.05	0.07
703149	TARRO_PIT 2	19/2/20	water	on-site	<0.01	0.14	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.1	0.06	<0.01	<0.01	0.05	<0.01	<0.01	0.04	0.34	<0.01	<0.05	0.14

Table T2 - Surface Water Analytical Results

Lab Report Number	Field ID	Date	Matrix Type	Location	Perfluoropentane sulfonic acid (PFPeS)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	Sum of PFAS	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	Perfluorooctanoic acid (PFOA)
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL					0.01	0.01	0.01	0.01	0.01	0.01	0.1	0.05	0.01	0.01	0.05	0.01
PFAS NEMP 2018 Table 1 Health Drinking Water													0.07			0.56
NHMRC 2019 Health Recreational Water													2			10
PFAS NEMP 2018 Table 5 Freshwater 95%																220
PFAS NEMP 2018 Table 5 Freshwater 99%																19
683251	MW01	17/10/19	water	on-site	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.05	<0.01	<0.01	<0.05	<0.01
683251	MW02	17/10/19	water	on-site	0.11	0.19	<0.01	<0.01	<0.01	0.66	1.44	1.3	0.64	0.28	<0.05	0.02
683251	MW03	17/10/19	water	on-site	<0.01	0.02	<0.01	<0.01	<0.01	0.04	<0.1	0.09	0.04	<0.01	<0.05	<0.01
703149	MW01	20/2/20	water	on-site	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.05	<0.01	<0.01	<0.05	<0.01
703149	MW02	20/2/20	water	on-site	0.04	0.10	<0.01	<0.01	<0.01	0.27	0.68	0.62	0.26	0.1	<0.05	0.01
703149	MW03	20/2/20	water	on-site	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.1	<0.05	0.03	0.02	<0.05	<0.01
680454	SW01	1/10/19	water	on-site	0.39	1.3	<0.01	<0.01	<0.01	3.44	7.29	6.66	3.2	2.24	<0.05	0.24
680454	SW02	1/10/19	water	on-site	<0.01	0.02	<0.01	<0.01	<0.01	0.07	0.13	0.13	0.05	0.05	<0.05	0.02
697518	SW01	17/1/20	water	on-site	0.06	0.8	<0.01	<0.01	<0.01	0.7	2.37	2.25	0.64	0.5	<0.05	0.06
697518	SW02	17/1/20	water	on-site	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.05	<0.01	0.01	<0.05	0.01
693205	SW03	12/12/19	water	off-site	0.01	0.02	<0.01	<0.01	<0.01	0.14	0.21	0.2	0.13	0.08	<0.05	0.01
703149	SW03	19/2/20	water	off-site	<0.01	0.02	<0.01	<0.01	<0.01	0.15	0.2	0.2	0.14	0.09	<0.05	0.01
693205	SW04	12/12/19	water	off-site	0.01	0.03	<0.01	<0.01	<0.01	0.14	0.23	0.22	0.13	0.08	<0.05	0.01
703149	SW04	19/2/20	water	off-site	<0.01	0.02	<0.01	<0.01	<0.01	0.14	0.19	0.19	0.14	0.08	<0.05	<0.01
697518	SW05	17/1/20	water	on-site	<0.01	0.07	<0.01	<0.01	<0.01	0.07	0.19	0.19	0.05	0.06	<0.05	0.02
697518	SW06	17/1/20	water	off-site	<0.01	0.05	<0.01	<0.01	<0.01	0.03	0.08	0.08	0.03	0.03	<0.05	<0.01
703149	SW07	19/2/20	water	off-site	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	0.08	0.07	0.05	0.02	<0.05	<0.01
703149	SW07A	19/2/20	water	off-site	<0.01	0.02	<0.01	<0.01	<0.01	0.13	0.19	0.19	0.12	0.06	<0.05	0.01
697518	SW08	17/1/20	water	off-site	<0.01	0.03	<0.01	<0.01	<0.01	0.01	0.04	<0.05	0.01	0.01	<0.05	<0.01
697518	SW09	17/1/20	water	off-site	<0.01	0.02	<0.01	<0.01	<0.01	0.02	0.04	<0.05	0.01	0.02	<0.05	0.01
708095	SW10	16/3/20	water	off-site	0.05	0.14	<0.01	<0.01	<0.01	1.62	2.19	2.07	1.58	1.24	<0.05	0.04
687690	TANK1	11/11/19	water	on-site	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.05	<0.01	<0.01	<0.05	<0.01
703149	TARRO_PIT 1	19/2/20	water	on-site	0.01	0.03	<0.01	<0.01	<0.01	0.17	0.31	0.29	0.14	0.1	<0.05	0.03
703149	TARRO_PIT 2	19/2/20	water	on-site	0.06	0.08	<0.01	<0.01	<0.01	0.52	1.05	0.94	0.48	0.18	<0.05	0.04

Table T3 - Produce Analytical Results

Lab Report Number	Field ID	Matrix Description	Date	PFOS/PFOA																					
				Perfluorodecanoic acid (PFDA)	Perfluorohexanoic acid (PFHxA)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-ethylperfluorooctanesulfonamidoethanol (NEtFOSE)	N-Methyl perfluorooctane sulfonamide (NMeFOSA)	N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	N-Methylperfluorooctanesulfonamidoethanol (N-MeFOSE)	Perfluorononanesulfonic acid (PFNS)(trace)	Perfluorobutane sulfonic acid (PFBS)	Perfluorobutanoic acid (PFBA)	Perfluorodecanesulfonic acid (PFDS)	Perfluorododecanoic acid (PFDoDA)	Perfluoropropanesulfonic acid (PFPrS)	Perfluoroheptane sulfonic acid (PFHpS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)	Perfluorooctane sulfonamide (PFOSA)
				µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
EQL				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.3	0.5	0.5
FSANZ 2017 Trigger points for investigation - Fruit																									
FSANZ 2017 Trigger points for investigation - Vegetables																									
687690	**PR01**	**Produce - limes**	**11/11/19**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.3	<0.5	<0.5
687690	**PR02**	**Produce - tomatoes**	**11/11/19**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.3	<0.5	<0.5
687690	**PR03**	**Produce - blueberries**	**11/11/19**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.3	<0.5	<0.5
687690	**PR04**	**Produce - kaffir limes**	**11/11/19**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5.9	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.3	<0.5	<0.5
687690	**PR05**	**Produce - garlic**	**11/11/19**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.3	<0.5	<0.5
687690	**QC3**		**11/11/19**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.3	<0.5	<0.5

Table T3 - Produce Analytical Results

Lab Report Number	Field ID	Matrix Description	Date	Perfluorooctanesulfonic acid (PFOS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	Sum of PFAS	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	Perfluorooctanoic acid (PFOA)
				µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
EQL				0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.3
FSANZ 2017 Trigger points for investigation - Fruit				0.6									0.6			5.1
FSANZ 2017 Trigger points for investigation - Vegetables				1.1									1.1			8.8
687690	**PR01**	**Produce - limes**	**11/11/19**	<0.3	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	2.1	2.1	<0.5	<0.5	<0.5	<0.3
687690	**PR02**	**Produce - tomatoes**	**11/11/19**	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.3
687690	**PR03**	**Produce - blueberries**	**11/11/19**	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.3
687690	**PR04**	**Produce - kaffir limes**	**11/11/19**	<0.3	<0.5	8.4	<0.5	<0.5	<0.5	<0.5	14.9	14.3	<0.5	<0.5	<0.5	<0.3
687690	**PR05**	**Produce - garlic**	**11/11/19**	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.3
687690	**QC3**		**11/11/19**	<0.3	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	2.2	2.2	<0.5	<0.5	<0.5	<0.3

SOLUTIONS FOR
COMPLEX PROJECTS

Appendices

Appendix A –
DSI Addendum 2

7 April 2020

Melanie Stutchbury
PFAS Senior Project Officer | Program Management Office
Fire & Rescue NSW
1 Amarina Ave
Greenacre, NSW, 2190

Dear Melanie

Addendum 2 to Detailed Site Investigation Report – Additional Investigation to close out data gaps for the Human Health and Ecological Risk Assessment
Our Lady of Lourdes Primary School Tarro

Nation Partners Pty Ltd (Nation Partners) has been engaged by Fire and Rescue NSW (FRNSW) to undertake a detailed site investigation (DSI) of the nature and extent of per- and poly-fluoroalkyl substances (PFAS) impacts, principally as the result of training using legacy Aqueous Film-Forming Foam (AFFF), at Our Lady of Lourdes (OLOL) Primary School, Tarro, New South Wales (NSW) (the site). The investigation is part of a broader program being undertaken by FRNSW across NSW to manage this legacy issue (see https://www.fire.nsw.gov.au/page.php?id=9170).

A DSI report was prepared by Nation Partners (*Detailed Site Investigation Report – PFAS Investigation, Our Lady of Lourdes Primary School Tarro,* December 2019), which detailed the findings of soil, groundwater and surface water sampling in an investigation area at the site, and presented a conceptual site model (CSM) of contamination sources, pathways and receptors. This addendum letter provides the results of additional sampling works to close out data gaps for the development of a Human Health and Environmental Risk Assessment (HHERA) and potential future management works.

The DSI report should be referred to for detailed information relating to the site, the relevant standards, guidelines and procedures that the works were completed in accordance with, and the findings of the broader environmental investigation.

1. Objectives

FRNSW's primary objective for the DSI was to understand potential contamination risks at the site and the surrounding areas resulting from historical AFFF use (in particular the risks associated with PFAS-containing foams). The objectives of the additional works presented herein were to:

» Assess the presence of PFAS in shallow offsite surface soil next to footpaths immediately adjacent to the site (running parallel to the north, east and south of the site);

» Further assess the presence of PFAS in shallow soils onsite;

» Assess the presence of PFAS in sediment and water collected from two filtration pits that are understood to filter water before it enters the infiltration system present onsite;

» Assess the presence of PFAS in surface water and sediment in stormwater pits onsite and in surface water and sediment downgradient of the site (offsite);

» Further assess the presence of PFAS in groundwater onsite;

» Compare results to published screening levels for PFAS to assess whether there was an exposure risk via the relevant pathway; and

» If required, provide recommendations to FRNSW on how to further assess or mitigate identified risks.

2. Scope of work

Nation Partners completed the following scope of work to meet the objectives:

» Attended the site on 17 January 2020 to collect onsite and offsite surface water and sediment samples;

» Attended the site on 22 January 2020 to collect onsite soil samples;

» Attended the site on the 19 and 20 February 2020 to collect samples of surface water, groundwater and soil (on and off the site);

» Attended the site on 16 March 2020 to collect an offsite surface water and sediment sample;

» Transported samples under chain-of custody to a National Association of Testing Authorities (NATA) accredited laboratory, where the following analyses were conducted:

– 11 x surface water samples for PFAS;

– 3 x groundwater samples for PFAS;

– 2 x filtration pit water samples for PFAS;

– 42 x shallow soil samples (45 x primary and 5 x quality control [QC]) for PFAS:

- 17 offsite footpath surface soil samples (16 x primary and 1 x QC);
- 28 onsite shallow soil samples (26 x primary and 2 x QC); and

– 5 x sediment samples;

- 4 onsite (2 from stormwater drains and 2 from filtration pits); and
- 1 offsite.

» Assessed the field and laboratory data collected, and prepared this addendum letter presenting the findings.

3. Field observations

An experienced Nation Partners environmental scientist or engineer conducted all sampling activities. A general description of samples collected is provided in **Table 1** below. Photographs are included in **Attachment 1** and bore logs are provided in **Attachment 2**.

Table 1 : General Sample Description

Sample Type	Depth (m)	Description	Location
Footpath soil samples	0.0-0.2	Topsoil, dark brown, moist No olfactory or visual indications of contamination	Offsite
Onsite shallow soil samples	0.0-0.2	Topsoil, dark brown, moist No olfactory or visual indications of contamination	Onsite
	0.2-1.0	Clay, dark brown, sandy (tending silty and stiff) No olfactory or visual indications of contamination	
Groundwater	NA	Mostly clear, slight yellow / brown tinge No olfactory or visual indications of contamination	Onsite

Sample Type	Depth (m)	Description	Location
Surface water	NA	Mostly stagnant, clear with a yellow / brown tinge, and mild to strong swampy odour (strongest odour at SW7a) No other olfactory or visual indications of contamination	Offsite
	NA	Clear ranging to brown/yellow tinged. Minor flow from stormwater pipes No olfactory or visual indications of contamination	Onsite
Filtration pit sediment	0.0-0.2	Brown silty sediment No olfactory or visual indications of contamination	Onsite

Field measurements recorded during surface water and groundwater sampling are provided in **Table A**, **Attachment 3**. The total dissolved solids (TDS) in groundwater was similar to the DSI results from October 2019, with lower TDS again reported in monitoring well MW03 compared to MW01 and MW02 (though the magnitude of difference was less in the recent monitoring). Groundwater standing water levels (SWLs) were similar in MW01 and MW02, but the SWL was approximately 1 m higher in MW03. The reason for this change may be due to the recent removal of a nearby demountable building combined with high rainfall in January 2020, resulting in increased infiltration and potential higher groundwater elevation in this area. The higher SWL at MW03 resulted in a minor change in the calculated groundwater flow direction, from due north in October 2019 to north-north-east in February 2020.

Most surface water parameters varied significantly, likely due to the differing environments and flow conditions during collection. Samples were consistently freshwater, with the exception of sample SW07A which was brackish and notably had a substantially higher conductivity than sample SW07.

4. Laboratory results

Laboratory results are summarised in **Table B** (soil and sediment)**, Table C** (water), **Table D** (soil waste classification - PFAS), and **Table E** (soil waste classification – non-PFAS) in **Attachment 3**. The waste classification tables include all results to date for completeness. Laboratory analysis certificates are provided in **Attachment 4**. Figures showing sample locations are also attached: **Figure 1** (onsite samples); **Figure 2** (S16 delineation samples); and **Figure 3** (surface water samples).

Soil and Sediment Results

Soil – Footpath samples

Of the 16 samples collected from shallow surface soil (0.0-0.2 metres below ground level [m bgl]) on footpaths immediately adjacent to the school, 9 exceeded the PFAS National Environmental Managment Plan (NEMP) health-based guidance value for residential land use for PFOS+PFHxS (0.009 mg/kg), and all were below the PFAS NEMP health-based guidance value for public open space PFOS (1 mg/kg).

The PFAS NEMP interim ecological indirect exposure criterion for PFOS (0.01 mg/kg) was exceeded in 9 samples. There were no exceedances of the PFAS NEMP ecological direct exposure criterion for PFOS (1 mg/kg).

Soil – Onsite samples

Of the 26 soil results collected from shallow surface soil onsite, 25 results exceeded the PFAS NEMP health-based guidance value for residential land use for PFOS+PFHxS (0.009 mg/kg), and 9 results exceeded the PFAS NEMP health-based guidance value for public open space (1 mg/kg). Four results exceeded the PFOS+PFHxS site specific screening level (SSSL) calculated in the DSI (1.67 mg/kg).

The PFAS NEMP interim ecological indirect exposure criterion for PFOS (0.01 mg/kg) was exceeded in 25 results, and 5 results exceeded the PFAS NEMP interim ecological direct exposure criterion for PFOS (1 mg/kg).

Sediment

None of the 3 sediment samples collected from locations co-located with offsite and onsite surface water samples exceeded any of the PFAS NEMP human health or ecological criteria. It is noted that there are no specific sediment assessment criteria in the NEMP.

Water Results

Surface water results

Of the 11 surface water results, 4 results exceeded PFAS NEMP health-based guidance value for drinking water for PFOS+PFHxS (0.07 µg/L). All samples were below the National Health and Medical Research Council (NHMRC, 2019) health-based guidance value for recreational water for PFOS+PFHxS (2 µg/L).

2 of the 11 surface water results exceeded the PFAS NEMP criterion for the freshwater 95% species protection level for PFOS (0.13 µg/L), while an additional 8 results exceeded the PFAS NEMP criterion for the freshwater 99% species protection level for PFOS (0.00023 µg/L – results above the laboratory limit of reporting [LOR] were considered to exceed the criterion).

PFAS concentrations were lower in surface water from the onsite stormwater pits (SW01 and SW02) than during the previous monitoring round in October 2019. Other locations were not previously sampled.

Groundwater results

Of the 3 groundwater results, 1 exceeded PFAS NEMP health-based guidance value for drinking water for PFOS+PFHxS (0.07 µg/L), and all samples were below the NHMRC health-based guidance value for recreational water.

2 samples exceeded the PFAS NEMP criterion for the freshwater 99% species protection level for PFOS (0.00023 µg/L), and all samples were below the PFAS NEMP criterion for the freshwater 95% species protection level for PFOS (0.13 µg/L).

Groundwater PFAS concentrations were also lower than during the previous monitoring round in October 2019.

Filtration Pit Samples

Water

Of the 2 water samples collected from filtration pit 1 and filtration pit 2, both samples exceeded PFAS NEMP health-based guidance value for drinking water for PFOS+PFHxS (0.07 µg/L), and both samples were below the NHMRC health-based guidance value for recreational water.

Of the 2 samples, 1 sample exceeded PFAS NEMP criterion for the freshwater 99% species protection level for PFOS (0.00023 µg/L), and one sample exceeded the PFAS NEMP criterion for the freshwater 95% species protection level for PFOS (0.13 µg/L).

Sediment

The results of the 2 sediment samples collected from the filtration pits present on the site exceeded the PFAS NEMP health-based guidance value for residential land use for PFOS+PFHxS (0.009 mg/kg), and the PFAS NEMP interim ecological indirect exposure criterion for PFOS (0.01 mg/kg).

Waste Classification

The results of waste classification sampling for PFAS and non-PFAS contaminants indicate that material at the site is classified as general solid waste (GSW), with the exception of soils in the vicinity of S16, S16a and S33. These soils are classified as restricted solid waste (RSW) due to their total and/or leachable PFAS concentrations.

5. Quality Assurance / Quality Control (QA/QC)

Field and laboratory QA/QC protocols were adopted in accordance with relevant guidance and as further described in the DSI report.

Sampling was conducted using a new pair of nitrile gloves for each sample to minimise the risk of cross contamination. Samples were placed directly into laboratory supplied sampling bags (for produce) or bottles (for tank water). Samples were then transferred into an ice chilled esky and transported by Nation Partners directly to the laboratory on the day of sampling.

A total of three intra-laboratory soil/sediment duplicates were collected and analysed for PFAS at a rate of 6.4%. This meets the rate recommended in relevant guidance and standards of 5-10%. No water duplicates were collected and analysed during these mobilisations, and due to a laboratory error no inter-laboratory soil duplicates were analysed. However, this is considered acceptable as appropriate QC sampling frequencies have been achieved over DSI sampling program.

Primary and duplicate sample results are provided in **Table F** in **Attachment 2**, and show good precision with only 10 relative percent difference (RPD) exceedances from 90 analysis pairs and 3 RPD exceedances for the key compounds PFOS, PFHxS and PFOA. The exceedances relate to the intra-laboratory duplicate (QC4) of the S16A_0.4-0.6 delineation sample. The maximum RPD was 84%, and although QC results were generally higher than the primary sample results both primary and duplicate samples reported the same exceedances of adopted screening and waste criteria. Therefore, these isolated exceedances are not considered to indicate a significant issue with data quality.

Laboratory QA/QC results, including holding times, laboratory duplicates, blanks, matrix spikes, control samples and surrogates, were reviewed and indicated no significant non-conformances. Overall, the field and laboratory QA/QC protocols and results are considered acceptable and indicate that the sampling data are suitable for the intent of the works.

6. Conclusions

Nation Partners has completed additional investigations at the site to address data gaps for the completion of the HHERA, and potential future site management, in relation to potential PFAS exposure pathways from surface water, shallow soil/sediment and groundwater on and off the site.

The data obtained have been assessed to be of appropriate quality and have been screened against tier 1 investigation levels, the DSI-derived SSSL, and waste classification criteria. PFAS have been reported in onsite and offsite soils, sediment and surface water and onsite groundwater, with a number of exceedances of screening criteria reported in various media. However, concentrations of PFAS were generally similar to those reported during the DSI (and were lower in onsite groundwater and surface water) and the initial assessment of risk presented in the DSI report has not altered based on the additional results.

Onsite soils, should they be required to be excavated and disposed offsite, have predominantly been classified as GSW. The exception are soils in the vicinity of sample locations S16, S16A and S33, which are classified as RSW due to their PFAS concentrations.

The HHERA will now be completed incorporating the DSI data and the information reported in this addendum into an updated conceptual site model (CSM). The HHERA will assess the significance of screening level exceedances and potential exposure risks from PFAS. Further recommendations to assess or manage unacceptable risks (if any) will be provided in the HHERA.

7. Limitations

The sole purpose of this addendum letter report (the 'Report') is to present the results of additional site investigations for the target investigation area as defined in this Report at Our Lady of Lourdes Primary School, Tarro, NSW. This Report has been prepared by Nation Partners for the sole use of Fire & Rescue NSW (FRNSW) (the 'Client') and in accordance with the scope of services developed and agreed between Nation Partners and the Client.

All reports and conclusions that deal with sub-surface conditions are based on interpretation and judgement of site conditions at the time site investigations were conducted, and as a result the description of a site's conditions has inherent uncertainty attached to it. Conditions at the site may have changed due to natural forces and/or operations on or near the site. Any decisions based on the findings of the Report must take into account any subsequent changes in site conditions and/or developments in legislative and regulatory requirements. The site investigation was targeted in nature and was not intended as a detailed, systematic assessment of all contamination in all media across the site. Nation Partners accepts no liability to the Client for any loss and/or damage incurred as a result of a change in the site conditions and/or regulatory/legislative framework since the date of the Report.

This Report should only be presented in full and should not be used to support any objective other than those detailed in the Report. In particular, the Report does not contain sufficient information to enable it to be used for any use other than the project specific requirements for which the Report was carried out. Nation Partners accepts no liability to the Client for any loss and/or damage incurred as a result of changes to the usage, size, design, layout, location or any other material change to the intended purpose contemplated under this Agreement. The Report is based on an interpretation of factual information available and the professional opinion and judgement of Nation Partners. Unless stated to the contrary, Nation Partners has not verified the accuracy or completeness of any information received from the Client or a third party for the purposes of preparing the Report. Nation Partners accepts no liability to the Client for any loss and/or damage incurred as a result of any inaccurate or incomplete information.

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Sincerely,
Nation Partners Pty Ltd

Luke Clements

Senior Principal

Attachments:

» *1. Photographs*

» *2. Bore Logs*

» *3. Results Tables*

» *3. Laboratory Certificates*

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Figures

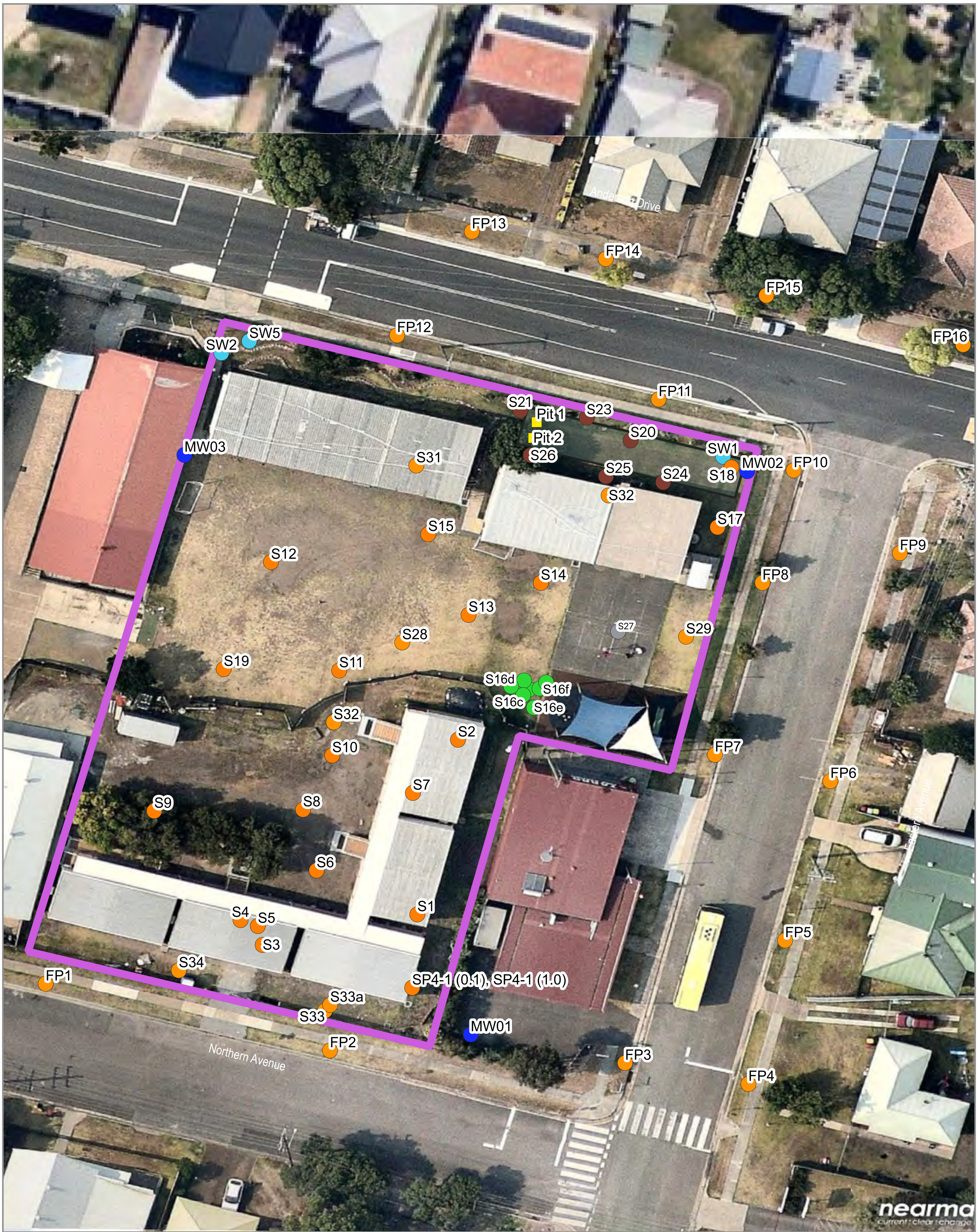

Figure 1: Sample Locations

FRNSW - PFAS Investigation (Tarro)
NP19039

Legend

- Investigation Area
- Infiltration System
- Surface Soil Samples
- Infiltration Pit Samples
- Surface Water Sediment Samples
- Groundwater Samples
- Concrete Samples
- Produce Soil Samples
- S16 Delination Samples

DATA SOURCES
Imagery:
Nearmaps, 2019; Sixmaps, 2019

0 10 20 m

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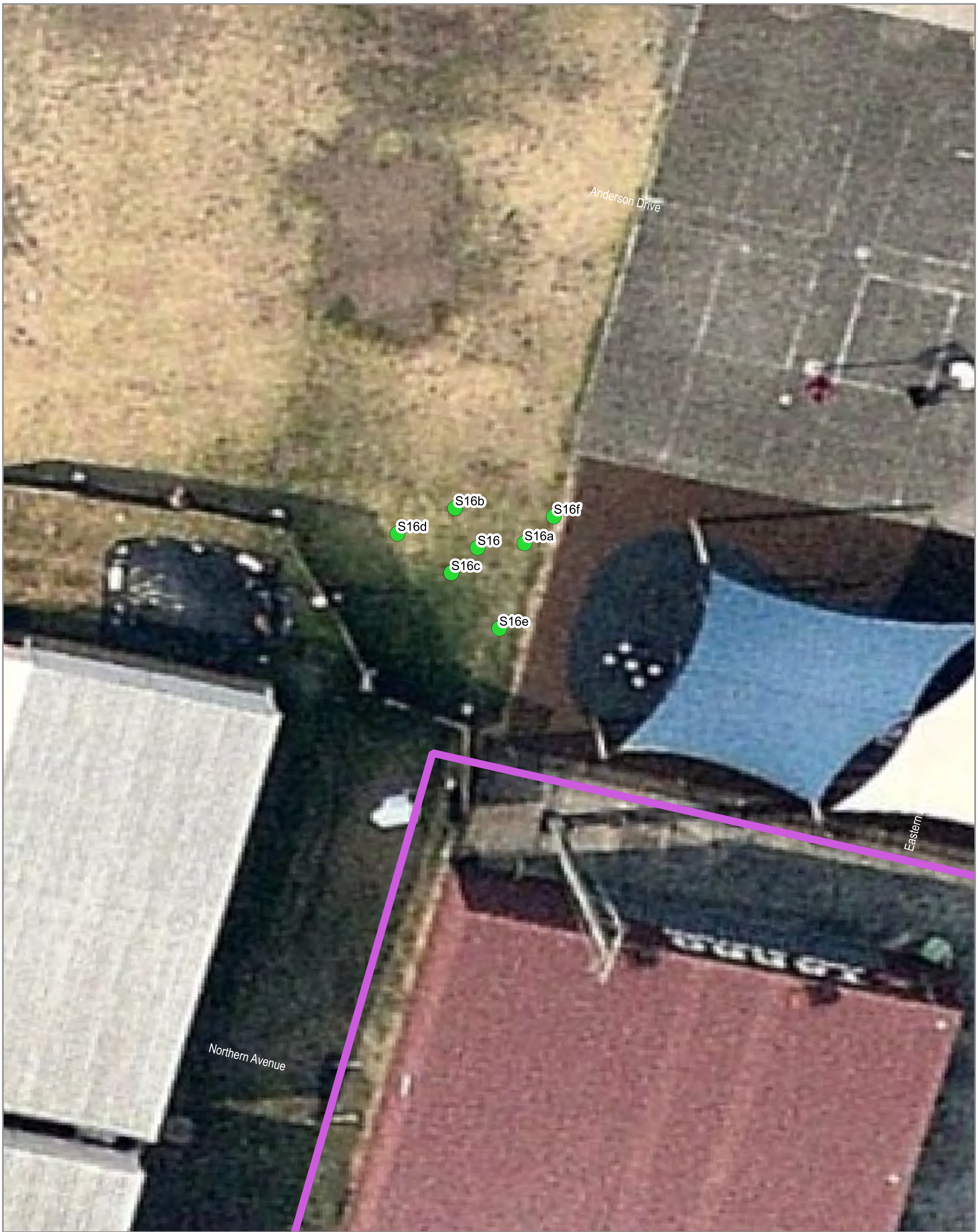

Figure 2: S16 Delineation Samples

FRNSW - PFAS Investigation (Tarro)
NP19039

Legend
S16 Delination Samples

0 2 4 m

DATA SOURCES
Imagery:
Nearmaps, 2019; Sixmaps, 2019

nation partners

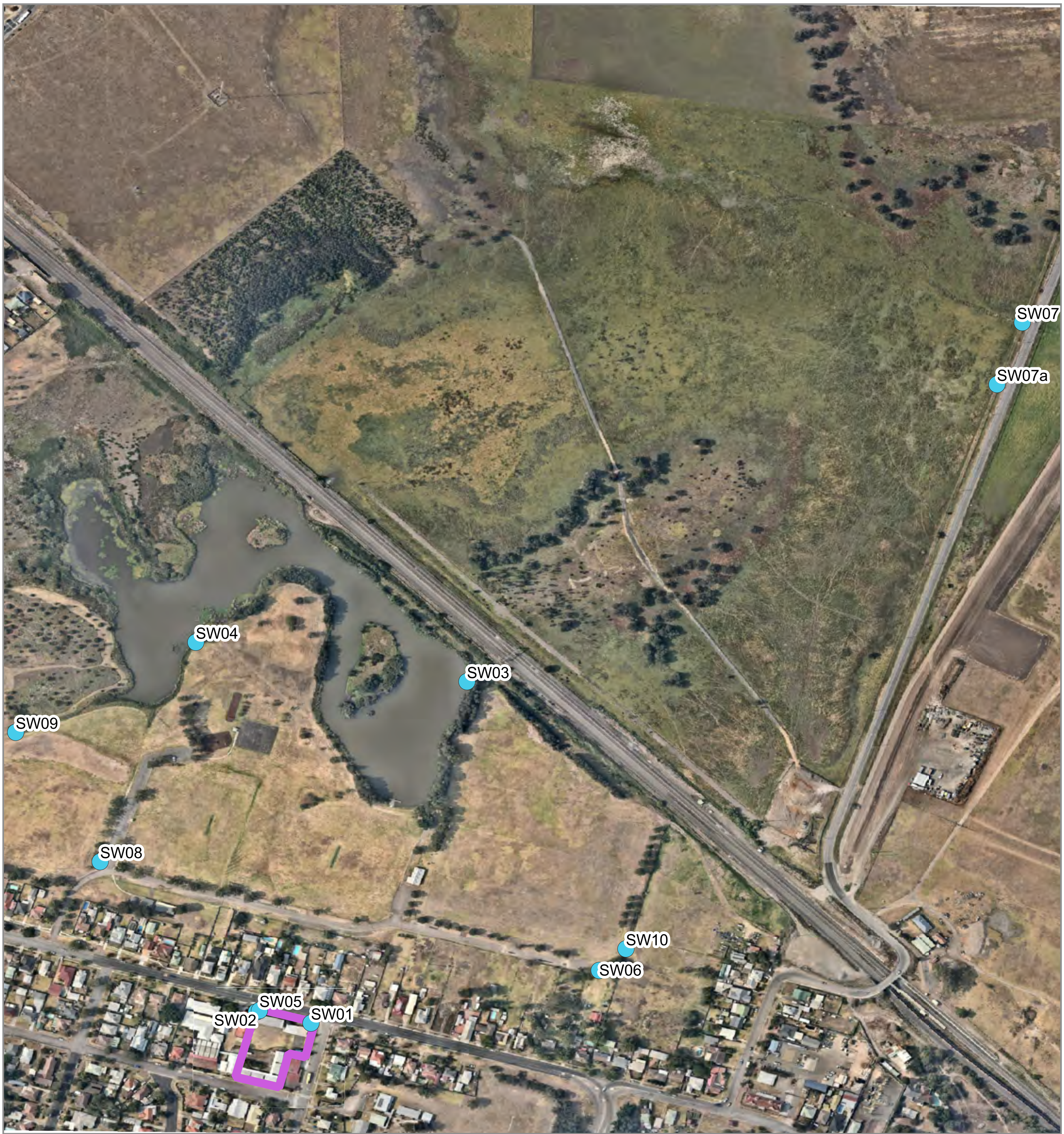

Figure 3: Surface Water Sample Locations

FRNSW - PFAS Investigation (Tarro)
NP19039

Legend
Investigation Area Boundary
Surface Water and Sediment Samples

DATA SOURCES
Imagery:
Nearmaps, 2019; Sixmaps, 2019

0 100 200 m

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Attachment 1 – Photographs

Photo 1: View west from SW07a sample location

Photo 2: View west from SW07 sample location

Photo 3: View west across the site showing new turf area

Photo 4: View west across the site showing new turf area and old demountable footprint over concreted area

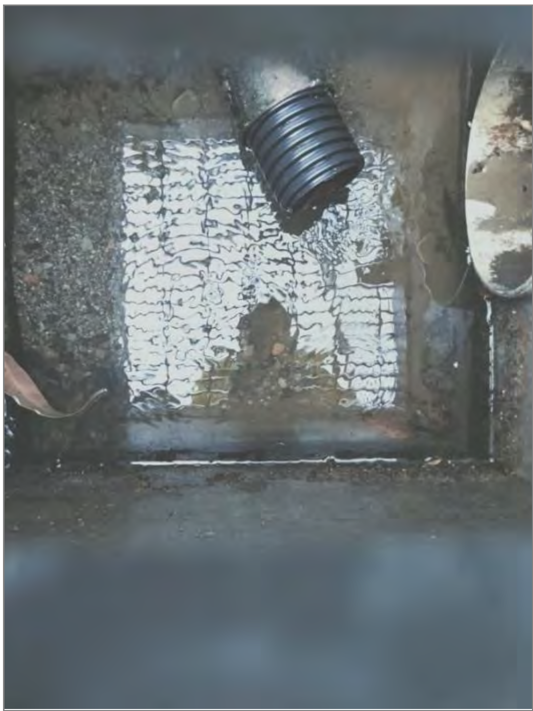

Photo 5: SW02

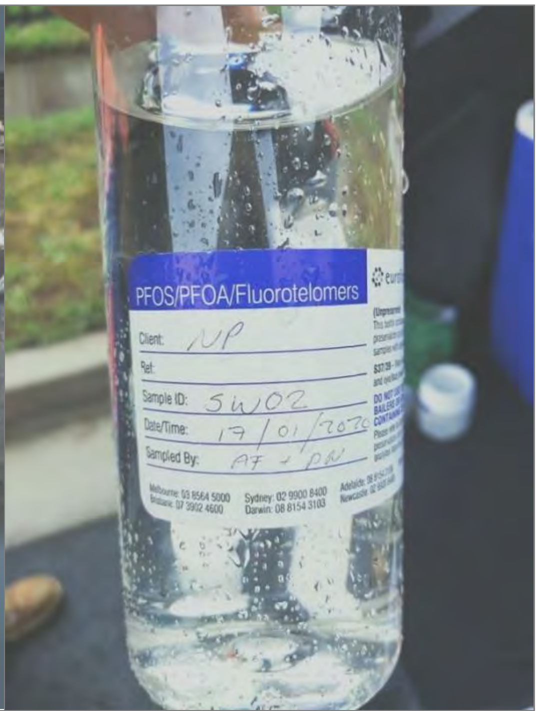

Photo 6: SW02

Photo 7: SD05

Photo 8: SW05

	
Photo 9: Soil sampling from freshly turfed area (S16a – 19 Feb 2020)	Soil sampling from freshly turfed area (S32 – 22 Jan 2020)

Photo 10: MW02 water sample similar to MW01 and MW03 in colour, turbidity)

	
Photo 11: Infiltration Pit 1	**Photo 12**: Infiltration Pit 2

	
Photo 13: SW09	**Photo 13**: SW04

	
Photo 14: SW06	**Photo 15**: SW10

Attachment 2 – Bore Logs

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Boring Log

Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** S28
Project No: NP19039	**Date drilled:** 22/01/2020		**Drill Rig Type:** Hand Auger
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA	**Drilling Contractor:** WorkPac	**Diameter:**
	Elevation:		**Hammer Type:**
Logged By: AF + PN	**Total Depth:**	**Bit Type:** 30mm	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	Lithology Soil Group Name: modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
		S28 (0.0-0.2) + WC		(fresh topsoil ~50mm over original soil)	
				topsoil (300mm)	
0.30		S28 (0.2-0.4) + WC			
0.5		S28 (0.4-0.6) + WC		Clay - dark brown, sandy clay	
0.75		S28 (0.6-0.8) + WC			
		S28 (0.8-1.0) + WC			
1.0				EOH @ 1.0	

Notes:
WC = waste classification sample collected

nation partners	Boring Log		
	Project Name: Tarro, NSW	**Client:** FRNSW	**Boring No:** S29
	Project No: NP19039 / **Date drilled:** 22/01/2020		**Drill Rig Type:** Hand Auger
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA / **Elevation:**	**Drilling Contractor:** WorkPac	**Diameter:** / **Hammer Type:**
Logged By: AF + PN	**Total Depth:**	**Bit Type:** 30mm	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	**Lithology** **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
		S29 (0.0-0.2) + WC			
				topsoil (250mm)	
0.25		S29 (0.2-0.4) + WC			
0.5		S29 (0.4-0.6)		Clay - dark brown, sandy clay	
0.75		S29 (0.6-0.8)			
		S29 (0.8-1.0)			
1.0				EOH @ 1.0	

Notes:
WC = waste classification sample collected

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Boring Log

Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** S30
Project No: NP19039	**Date drilled:** 22/01/2020		**Drill Rig Type:** Hand Auger
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA	**Drilling Contractor:** WorkPac	**Diameter:**
	Elevation:		**Hammer Type:**
Logged By: AF + PN	**Total Depth:**	**Bit Type:** 30mm	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
		S30 (0.0-0.2) + WC		~~topsoil (20mm)~~	
0.25		S30 (0.2-0.4) + WC			
0.5		S30 (0.4-0.6)		Clay - dark brown, sandy clay, more moist than previous holes	
0.75		S30 (0.6-0.8)			
1.0				EOH @ 0.8	

Notes:
WC = waste classification sample collected

nation partners	Boring Log			
	Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** S30
	Project No: NP19039	**Date drilled:** 22/01/2020		**Drill Rig Type:** Hand Auger
Site Address: Anderson Drive, Tarro, NSW		**Groundwater Depth:** NA	**Drilling Contractor:** WorkPac	**Diameter:**
		Elevation:		**Hammer Type:**
Logged By: AF + PN		**Total Depth:**	**Bit Type:** 30mm	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
		S31 (0.0-0.2) + WC		topsoil (50mm)	
0.25					
		S31 (0.2-0.4) + WC			
0.5		S31 (0.4-0.6)		Clay - dark brown, sandy clay	
0.75		S31 (0.6-0.8)			
1.0				EOH @ 0.75 (PVC pipe)	

Notes:
WC = waste classification sample collected

Boring Log			
Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** S32
Project No: NP19039	**Date drilled:** 22/01/2020		**Drill Rig Type:** Hand Auger
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA	**Drilling Contractor:** WorkPac	**Diameter:**
	Elevation:		**Hammer Type:**
Logged By: AF + PN	**Total Depth:**	**Bit Type:** 30mm	**Drill Crew:**

Depth (m)	**Sample Type**	**Sample ID**	**Graphic Log**	**Lithology** **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	**Contaminant Indicators**
	S32 (0.0-0.2) + WC + QC1			topsoil (300mm)	
0.25					
	S32 (0.2-0.4) + WC + QC2				
0.5		S32 (0.4-0.6)		Clay - dark brown, sandy clay	
0.75		S32 (0.6-0.8)			
		S32 (0.8-1.0)			
1.0				EOH @ 1.0	

Notes:
WC = waste classification sample collected

nation partners	Boring Log		
	Project Name: Tarro, NSW	**Client:** FRNSW	**Boring No:** S34
	Project No: NP19039 / **Date drilled:** 22/01/2020		**Drill Rig Type:** Hand Auger
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA / **Elevation:**	**Drilling Contractor:** WorkPac	**Diameter:** / **Hammer Type:**
Logged By: AF + PN	**Total Depth:**	**Bit Type:** 30mm	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
		S34 (0.0-0.2) + WC		topsoil (300mm)	
0.25					
		S34 (0.2-0.4) + WC			
0.5				Clay - dark brown, sandy clay	glass 0.0-0.4
				EOH @ 0.4 (refusal on compacted clay - moved hole (33a)approx 500mm north east)	
0.75		S34 (0.4-0.6)			
		S34 (0.6-0.8)			
1.0		S34 (0.8-1.0)		EOH @ 1.0 (PVC pipe)	

Notes:
WC = waste classification sample collected

nation partners	Boring Log			
	Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** S33
	Project No: NP19039	**Date drilled:** 22/01/2020		**Drill Rig Type:** Hand Auger
Site Address: Anderson Drive, Tarro, NSW		**Groundwater Depth:** NA	**Drilling Contractor:** WorkPac	**Diameter:**
		Elevation:		**Hammer Type:**
Logged By: AF + PN		**Total Depth:**	**Bit Type:** 30mm	**Drill Crew:**

Depth (m)	**Sample Type**	**Sample ID**	**Graphic Log**	**Lithology** **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	**Contaminant Indicators**
	S33 (0.0-0.2) + WC + QC3			topsoil (300mm)	
0.25					
		S33 (0.2-0.4) + WC			
0.5				Clay - dark brown, sandy clay EOH @ 0.4 (refusal on compacted clay - moved hole (33a)approx 500mm north east)	
0.75		S33a (0.4-0.6)			
		S33a (0.6-0.8)			
1.0				EOH @ 0.8 (PVC pipe)	

Notes:
WC = waste classification sample collected

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Boring Log

Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** S16a
Project No: NP19039	**Date drilled:** 22/01/2020		**Drill Rig Type:** Hand Auger
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA	**Drilling Contractor:** WorkPac	**Diameter:**
	Elevation:		**Hammer Type:**
Logged By: AF + PN	**Total Depth:**	**Bit Type:** 30mm	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	Lithology Soil Group Name: modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
				(fresh topsoil/turf, dark brown, clayey silt, moist - , dark brown, clayey silt, moist - , dark brown, clayey silt, moist - topsoil (300mm)	
0.30		S16a (0.2-0.4) + WC			
0.5		S16a (0.4-0.6) + WC + QC4		Clay - dark brown, sandy clay	
0.75		S16a (0.6-0.8)			
0.8				EOH @ 0.8	

Notes:
WC = waste classification sample collected

nation partners	Boring Log			
	Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** S16b
	Project No: NP19039	**Date drilled:** 22/01/2020		**Drill Rig Type:** Hand Auger
Site Address: Anderson Drive, Tarro, NSW		**Groundwater Depth:** NA	**Drilling Contractor:** WorkPac	**Diameter:**
		Elevation:		**Hammer Type:**
Logged By: AF + PN		**Total Depth:**	**Bit Type:** 30mm	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
				(fresh topsoil/turf, dark brown, clayey silt, moist - , dark brown, clayey silt, moist - ~50mm over original soil)	
				topsoil (300mm)	
0.30		S16b (0.2-0.4) + WC + QC5			
0.5		S16b (0.4-0.6) + WC		Clay - dark brown, sandy clay	
0.75		S16b (0.6-0.8)			
0.8					
				EOH @ 0.8	

Notes:
WC = waste classification sample collected

nation partners	Boring Log			
	Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** S16c
	Project No: NP19039	**Date drilled:** 22/01/2020		**Drill Rig Type:** Hand Auger
Site Address: Anderson Drive, Tarro, NSW		**Groundwater Depth:** NA **Elevation:**	**Drilling Contractor:** WorkPac	**Diameter:** **Hammer Type:**
Logged By: AF + PN		**Total Depth:**	**Bit Type:** 30mm	**Drill Crew:**

Depth (m)	**Sample Type**	**Sample ID**	**Graphic Log**	**Lithology** **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	**Contaminant Indicators**
				(fresh topsoil/turf, dark brown, clayey silt, moist - , dark brown, clayey silt, moist - ~50mm over original soil)	
				topsoil (300mm)	
0.30		S16c (0.2-0.4) + WC			
0.5		S16c (0.4-0.6) + WC		Clay - dark brown, sandy clay	
0.75		S16c (0.6-0.8)			
0.8					
				EOH @ 0.8	

Notes:
WC = waste classification sample collected

nation partners	Boring Log		
	Project Name: Tarro, NSW	**Client:** FRNSW	**Boring No:** S16d
	Project No: NP19039 / **Date drilled:** 19/02/2020		**Drill Rig Type:** Hand Auger
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA / **Elevation:**	**Drilling Contractor:** WorkPac	**Diameter:** / **Hammer Type:**
Logged By: AF + PN	**Total Depth:**	**Bit Type:** 30mm	**Drill Crew:**

Depth (m)	**Sample Type**	**Sample ID**	**Graphic Log**	**Lithology** **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	**Contaminant Indicators**
				(fresh topsoil/turf, dark brown, clayey silt, moist - , dark brown, clayey silt, moist - ~50mm over original soil) topsoil (300mm)	
0.30		S16d (0.2-0.4) + WC + QC6			
0.5		S16d (0.4-0.6) + WC		Clay - dark brown, sandy clay	
0.75		S16d (0.6-0.8)			
0.8					
				EOH @ 0.8	

Notes:

WC = waste classification sample collected

nation partners	Boring Log		
	Project Name: Tarro, NSW	**Client:** FRNSW	**Boring No:** S16e
	Project No: NP19039 / **Date drilled:** 19/02/2020		**Drill Rig Type:** Hand Auger
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA / **Elevation:**	**Drilling Contractor:** WorkPac	**Diameter:** / **Hammer Type:**
Logged By: AF + PN	**Total Depth:**	**Bit Type:** 30mm	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
		S16e (0.2-0.4) + WC + QC7		(fresh topsoil/turf, dark brown, clayey silt, moist - , dark brown, clayey silt, moist - ~50mm over original soil) topsoil (300mm)	
0.30					
0.5		S16e (0.4-0.6) + WC		Clay - dark brown, sandy clay	
0.75		S16e (0.6-0.8)			
0.8					
				EOH @ 0.8	

Notes:
WC = waste classification sample collected

Boring Log			
Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** S16f
Project No: NP19039	**Date drilled:** 19/02/2020		**Drill Rig Type:** Hand Auger
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA	**Drilling Contractor:** WorkPac	**Diameter:**
	Elevation:		**Hammer Type:**
Logged By: AF + PN	**Total Depth:**	**Bit Type:** 30mm	**Drill Crew:**

Depth (m)	**Sample Type**	**Sample ID**	**Graphic Log**	**Lithology** **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	**Contaminant Indicators**
				(fresh topsoil/turf, dark brown, clayey silt, moist - , dark brown, clayey silt, moist - ~50mm over original soil)	
				topsoil (300mm)	
0.30		S16d (0.2-0.4) + WC + QC8			
0.5		S16f (0.4-0.6) + WC		Clay - dark brown, sandy clay	
0.75		S16f (0.6-0.8)			
0.8					
				EOH @ 0.8	

Notes:
WC = waste classification sample collected

nation partners

Boring Log			
Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** FP1
Project No: NP19039	**Date drilled:** 20/02/2020		**Drill Rig Type:** Shovel
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA	**Drilling Contractor:** NA	**Diameter:**
	Elevation:		**Hammer Type:**
Logged By: AF + PN + MB	**Total Depth:** 0.2m	**Bit Type:** NA	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	**Lithology** **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
				Topsoil, dark brown clayey silt, moist - soft	
		FP1_0.0-0.2			
0.20					
				EOH @0.2 (desired depth achieved)	

Notes:

Boring Log

Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** FP2
Project No: NP19039	**Date drilled:** 20/02/2020		**Drill Rig Type:** Shovel
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA	**Drilling Contractor:** NA	**Diameter:**
	Elevation:		**Hammer Type:**
Logged By: AF + PN + MB	**Total Depth:** 0.2m	**Bit Type:** NA	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
				Topsoil, dark brown clayey silt, moist, soft	
		FP2_0.0-0.2			
0.20					
				EOH @0.2 (desired depth achieved)	

Notes:

nation partners	Boring Log			
	Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** FP3
	Project No: NP19039	**Date drilled:** 20/02/2020		**Drill Rig Type:** Shovel
Site Address: Anderson Drive, Tarro, NSW		**Groundwater Depth:** NA	**Drilling Contractor:** NA	**Diameter:**
		Elevation:		**Hammer Type:**
Logged By: AF + PN + MB		**Total Depth:** 0.2m	**Bit Type:** NA	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
				Topsoil, dark brown clayey silt, moist, soft	
		FP3_0.0-0.2			
0.20					
				EOH @0.2 (desired depth achieved)	

Notes:

nation partners

Boring Log			
Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** FP4
Project No: NP19039	**Date drilled:** 20/02/2020		**Drill Rig Type:** Shovel
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA	**Drilling Contractor:** NA	**Diameter:**
	Elevation:		**Hammer Type:**
Logged By: AF + PN + MB	**Total Depth:** 0.2m	**Bit Type:** NA	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
				Topsoil, dark brown clayey silt, moist, soft	
		FP4_0.0-0.2			
0.20					
				EOH @0.2 (desired depth achieved)	

Notes:

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Boring Log

Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** FP5
Project No: NP19039	**Date drilled:** 20/02/2020		**Drill Rig Type:** Shovel
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA	**Drilling Contractor:** NA	**Diameter:**
	Elevation:		**Hammer Type:**
Logged By: AF + PN + MB	**Total Depth:** 0.2m	**Bit Type:** NA	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
				Topsoil, dark brown clayey silt, moist, soft	
		FP5_0.0-0.2			
0.20					
				EOH @0.2 (desired depth achieved)	

Notes:

nation partners	Boring Log		
	Project Name: Tarro, NSW	**Client:** FRNSW	**Boring No:** FP6
	Project No: NP19039 / **Date drilled:** 20/02/2020		**Drill Rig Type:** Shovel
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA / **Elevation:**	**Drilling Contractor:** NA	**Diameter:** / **Hammer Type:**
Logged By: AF + PN + MB	**Total Depth:** 0.2m	**Bit Type:** NA	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
				Topsoil, dark brown clayey silt, moist, soft	
		FP6_0.0-0.2			
0.20					
				EOH @0.2 (desired depth achieved)	

Notes:

nation partners	Boring Log		
	Project Name: Tarro, NSW	**Client:** FRNSW	**Boring No:** FP7
	Project No: NP19039 / **Date drilled:** 20/02/2020		**Drill Rig Type:** Shovel
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA / **Elevation:**	**Drilling Contractor:** NA	**Diameter:** / **Hammer Type:**
Logged By: AF + PN + MB	**Total Depth:** 0.2m	**Bit Type:** NA	**Drill Crew:**

Depth (m)	**Sample Type**	**Sample ID**	**Graphic Log**	**Lithology** **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	**Contaminant Indicators**
				Topsoil, dark brown clayey silt, moist, soft	
		FP7_0.0-0.2			
0.20					
				EOH @0.2 (desired depth achieved)	

Notes:

nation partners

Boring Log			
Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** FP8
Project No: NP19039	**Date drilled:** 20/02/2020		**Drill Rig Type:** Shovel
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA	**Drilling Contractor:** NA	**Diameter:**
	Elevation:		**Hammer Type:**
Logged By: AF + PN + MB	**Total Depth:** 0.2m	**Bit Type:** NA	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
				Topsoil, dark brown clayey silt, moist, soft	
		FP8_0.0-0.2			
0.20					
				EOH @0.2 (desired depth achieved)	

Notes:

nation partners	Boring Log			
	Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** FP9
	Project No: NP19039	**Date drilled:** 20/02/2020		**Drill Rig Type:** Shovel
Site Address: Anderson Drive, Tarro, NSW		**Groundwater Depth:** NA	**Drilling Contractor:** NA	**Diameter:**
		Elevation:		**Hammer Type:**
Logged By: AF + PN + MB		**Total Depth:** 0.2m	**Bit Type:** NA	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
				Topsoil - dark brown, clayey silt, moist, soft (more dry and hard than the other samples)	
		FP9_0.0-0.2			
0.20					
				EOH @0.2 (desired depth achieved)	
				NB: sample was taken next to pooled surface water on gra road side of the footpath - pooled water is also present on school near the fence adjacent to this area	

Notes:

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Boring Log

Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** FP10
Project No: NP19039	**Date drilled:** 20/02/2020		**Drill Rig Type:** Shovel
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA	**Drilling Contractor:** NA	**Diameter:**
	Elevation:		**Hammer Type:**
Logged By: AF + PN + MB	**Total Depth:** 0.2m	**Bit Type:** NA	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	Lithology Soil Group Name: modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
				Topsoil, dark brown clayey silt, moist, soft	
		FP10_0.0-0.2			
0.20					
				EOH @0.2 (desired depth achieved)	

Notes:

Boring Log			
Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** FP11
Project No: NP19039	**Date drilled:** 20/02/2020		**Drill Rig Type:** Shovel
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA	**Drilling Contractor:** NA	**Diameter:**
	Elevation:		**Hammer Type:**
Logged By: AF + PN + MB	**Total Depth:** 0.2m	**Bit Type:** NA	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
				Topsoil, dark brown clayey silt, moist, soft	
		FP11_0.0-0.2			
0.20					
				EOH @0.2 (desired depth achieved)	

Notes:

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Boring Log

Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** FP12
Project No: NP19039	**Date drilled:** 20/02/2020		**Drill Rig Type:** Shovel
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA	**Drilling Contractor:** NA	**Diameter:**
	Elevation:		**Hammer Type:**
Logged By: AF + PN + MB	**Total Depth:** 0.2m	**Bit Type:** NA	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	**Lithology** **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
				Topsoil, dark brown clayey silt, moist, soft	
		FP12_0.0-0.2			
0.20					
				EOH @0.2 (desired depth achieved)	

Notes:

nation partners	Boring Log			
	Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** FP13
	Project No: NP19039	**Date drilled:** 20/02/2020		**Drill Rig Type:** Shovel
Site Address: Anderson Drive, Tarro, NSW		**Groundwater Depth:** NA	**Drilling Contractor:** NA	**Diameter:**
		Elevation:		**Hammer Type:**
Logged By: AF + PN + MB		**Total Depth:** 0.2m	**Bit Type:** NA	**Drill Crew:**

Depth (m)	**Sample Type**	**Sample ID**	**Graphic Log**	**Lithology** **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	**Contaminant Indicators**
				Topsoil, dark brown clayey silt, moist, soft	
		FP13_0.0-0.2			
0.20					
				EOH @0.2 (desired depth achieved)	

Notes:

Boring Log			
Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** FP14
Project No: NP19039	**Date drilled:** 20/02/2020		**Drill Rig Type:** Shovel
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA	**Drilling Contractor:** NA	**Diameter:**
	Elevation:		**Hammer Type:**
Logged By: AF + PN + MB	**Total Depth:** 0.2m	**Bit Type:** NA	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	**Lithology** **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
				Topsoil, dark brown clayey silt, moist, soft	
		FP14_0.0-0.2			
0.20					
				EOH @0.2 (desired depth achieved)	

Notes:

nation partners	Boring Log			
	Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** FP15
	Project No: NP19039	**Date drilled:** 20/02/2020		**Drill Rig Type:** Shovel
Site Address: Anderson Drive, Tarro, NSW		**Groundwater Depth:** NA	**Drilling Contractor:** NA	**Diameter:**
		Elevation:		**Hammer Type:**
Logged By: AF + PN + MB		**Total Depth:** 0.2m	**Bit Type:** NA	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	**Lithology** **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
				Topsoil, dark brown clayey silt, moist, soft	
		FP15_0.0-0.2			
0.20					
				EOH @0.2 (desired depth achieved)	

Notes:

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Boring Log

Project Name: Tarro, NSW		**Client:** FRNSW	**Boring No:** FP16
Project No: NP19039	**Date drilled:** 20/02/2020		**Drill Rig Type:** Shovel
Site Address: Anderson Drive, Tarro, NSW	**Groundwater Depth:** NA	**Drilling Contractor:** NA	**Diameter:**
	Elevation:		**Hammer Type:**
Logged By: AF + PN + MB	**Total Depth:** 0.2m	**Bit Type:** NA	**Drill Crew:**

Depth (m)	Sample Type	Sample ID	Graphic Log	Lithology Soil Group Name: modifier, color, moisture, density/consistency, grain size, other descriptors	Contaminant Indicators
				Topsoil, dark brown clayey silt, moist, soft	
		FP16_0.0-0.2 + QC9			
0.20					
				EOH @0.2 (desired depth achieved)	

Notes:

Attachment 3 – Results Tables

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Groundwater Field Parameters

		MW01	MW02	MW03
		17/2/20	17/2/20	19/2/19
		Water	Water	Water
Field Data	**Units**			
Observations		Clear, slight orange / brown tinge	Clear, slight red tinge	Slightly turbid, brown red tinge
Standing Water Level	mbtoc	4.735	4.765	4.84
Casing Elevation	mAHD	9.105	7.415	8.07
Standing Water Level	mAHD	4.37	2.65	3.23
Temperature	Celcius	22	21.5	21.5
Dissolved Oxygen	%	9	8.2	30.1
Electrical Conductivity	µS/cm	21133	12867	19253
TDS	ppm	14566	8957	12707
pH		4.35	4.47	5.19
Redox Potential	mV	185	177.8	172.8

Surface Water Field Parameters

		SW01	SW02	SW03	SW03	SW04	SW04	SW05	SW06	SW07	SW07a	SW08	SW09	SW10
		17/1/20	17/1/20	12/12/19	19/2/20	12/12/19	19/2/20	17/1/20	17/1/20	19/2/20	19/2/20	17/1/20	17/1/20	16/3/20
		Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
Field Data	**Units**													
Observations		Clear, slight yellow tinge, flowing from northern pipe	Clear, slight brown, flowing into drain from both pipes (west and south)	Slightly turbid, light brown, largely stagnant with slight onshore breeze with ripples	Stagnant, yellow tinge, slightly turbid	Stagnant, slightly turbid	Stagnant water, slight swampy odour, brown tinge, slightly turbid	Brown, drain full of leaves and sediment	Water flowing, slight brown /yellow tinge	Stagnant, slight yellow tinge	Stagnant, yellow / brown, slightly turbid, swampy odour	Water flowing (trickle), slight brown tinge, low water level	Water flowing, slightly brown, high water level	Water stagnant, light brown
Temperature	Celcius	23.6	23.1	23.5	27	22.4	26.6	23.6	26.9	25.1	28.1	25.3	25.8	-
Dissolved Oxygen	%	22.5	82	65.2	37.3	10.1	53	32.2	74.4	9.1	21.8	66.4	94.2	-
Electrical Conductivity	µS/cm	123.6	54.5	6.9	708	867	607	292.3	209.2	7235	742	78.4	133.6	-
pH		7.82	9.58	7.4	8.62	7.14	8.2	7.75	7.27	6.82	6.03	7.72	7.87	-
Redox Potential	mV	78.1	78.7	69.6	59.9	-118.2	648	60	87.1	-76.7	42.1	84.3	72.9	-

Table B - Soil PFAS.xlsx

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Field ID	Date	PFOS/PFOA																																		
		Perfluorodecanoic acid (PFDA)	Perfluorohexanoic acid (PFHxA)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	N-Ethyl perfluorooctane sulfonamide	N-ethyl-perfluorooctanesulfonamidoacetic acid	N-ethylperfluorooctanesulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-methylperfluorooctane	N-Methylperfluorooctanesulfonamidoethanol	Perfluorononanesulfonic acid (PFNS)(trace)	Perfluorobutane sulfonic acid (PFBS)	Perfluorobutanoic acid (PFBA)	Perfluorodecanesulfonic acid (PFDS)	Perfluorododecanoic acid (PFDoDA)	Perfluoropropanesulfonic acid (PFPrS)	Perfluoroheptane sulfonic acid (PFHpS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)	Perfluorooctane sulfonamide (PFOSA)	Perfluorooctanesulfonic acid (PFOS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	Sum of PFAS	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	Perfluorooctanoic acid (PFOA)
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL		0.005	0.005	0.005	0.005	0.005	0.01	0.005	0.005	0.01	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.05	0.01	0.005	0.005	0.01	0.005
PFAS NEMP 2018 Table 2 Health Public open space																																	1			10
PFAS NEMP 2018 Table 2 Health Residential accessible soil																																	0.009			0.1
PFAS NEMP 2018 Table 3 Interim EDE Public open space																									1											10
PFAS NEMP 2018 Table 3 Interim EIE Residential																									0.01											
FP1_0.0-0.2	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0064	<0.005	<0.005	<0.005	<0.005	<0.005	0.0064	<0.05	<0.01	0.0064	0.0064	<0.01	<0.005
FP2_0.0-0.2	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.047	<0.005	<0.005	<0.005	<0.005	<0.005	0.047	<0.05	0.047	0.047	0.047	<0.01	<0.005
FP3_0.0-0.2	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.018	<0.005	<0.005	<0.005	<0.005	<0.005	0.018	<0.05	0.018	0.018	0.018	<0.01	<0.005
FP4_0.0-0.2	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0069	<0.005	<0.005	<0.005	<0.005	<0.005	0.0069	<0.05	<0.01	0.0069	0.0069	<0.01	<0.005
FP5_0.0-0.2	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.021	<0.005	<0.005	<0.005	<0.005	<0.005	0.021	<0.05	0.021	0.021	0.021	<0.01	<0.005
FP6_0.0-0.2	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	0.025	<0.05	0.025	0.025	0.025	<0.01	<0.005
FP7_0.0-0.2	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	0.012	<0.005	<0.005	0.019	<0.005	<0.005	<0.005	<0.005	<0.005	0.0087	<0.005	<0.005	0.11	<0.005	<0.005	<0.005	<0.005	0.0097	0.1187	0.1594	0.1187	0.1187	0.11	<0.01	<0.005
FP8_0.0-0.2	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.14	<0.005	<0.005	<0.005	<0.005	<0.005	0.14	0.14	0.14	0.14	0.14	<0.01	<0.005
FP9_0.0-0.2	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.033	<0.005	<0.005	<0.005	<0.005	<0.005	0.033	<0.05	0.033	0.033	0.033	<0.01	<0.005
FP10_0.0-0.2	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.15	<0.005	<0.005	<0.005	<0.005	<0.005	0.15	0.15	0.15	0.15	0.15	<0.01	<0.005
FP11_0.0-0.2	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	0.02	<0.05	0.02	0.02	0.02	<0.01	<0.005
FP12_0.0-0.2	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
FP13_0.0-0.2	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
FP14_0.0-0.2	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
FP15_0.0-0.2	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
FP16_0.0-0.2	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
S16A_0.2-0.4	19/2/20	<0.005	0.03	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	0.015	0.0058	0.0079	<0.005	<0.005	<0.005	0.0098	<0.005	0.015	0.063	0.018	<0.005	2.2	0.0058	0.036	<0.005	<0.005	<0.005	2.282	2.4253	2.3767	2.263	2.219	<0.01	0.019
S16A_0.4-0.6	19/2/20	<0.005	0.032	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	0.0074	0.0082	0.0078	<0.005	<0.005	<0.005	0.011	<0.005	0.013	0.052	0.018	<0.005	1.9	0.0063	0.04	<0.005	<0.005	<0.005	1.969	2.1127	2.07	1.952	1.917	<0.01	0.017
S16B_0.2-0.4	19/2/20	<0.005	0.016	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	0.017	<0.005	0.0066	0.018	<0.005	<0.005	<0.005	<0.005	0.0076	0.02	0.0097	<0.005	0.58	<0.005	0.028	<0.005	<0.005	<0.005	0.606	0.7089	0.6642	0.6	0.586	<0.01	0.0060
S16B_0.4-0.6	19/2/20	<0.005	0.017	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	0.0062	<0.005	<0.005	<0.005	<0.005	<0.005	0.0095	0.022	0.0059	<0.005	0.61	<0.005	0.03	<0.005	<0.005	<0.005	0.6398	0.7084	0.7025	0.632	0.6178	<0.01	0.0078
S16C_0.2-0.4	19/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0058	0.0065	<0.005	0.17	<0.005	0.0056	<0.005	<0.005	<0.005	0.1758	0.1879	0.1814	0.1758	0.17	<0.01	<0.005
S16C_0.4-0.6	19/2/20	<0.005	0.011	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0058	0.0098	0.0052	<0.005	0.15	<0.005	0.017	<0.005	<0.005	<0.005	0.1598	0.1988	0.1936	0.1598	0.15	<0.01	<0.005
S28(0.0-0.2)	22/1/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.062	<0.005	0.011	<0.005	<0.005	<0.005	0.062	0.073	0.073	0.062	0.062	<0.01	<0.005
S28(0.2-0.4)	22/1/20	<0.005	0.02	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	0.0062	<0.005	<0.005	<0.005	<0.005	<0.005	0.027	0.034	<0.005	<0.005	0.18	<0.005	0.027	<0.005	<0.005	<0.005	0.226	0.3062	0.3062	0.214	0.192	<0.01	0.012
S29(0.0-0.2)	22/1/20	<0.005	0.02	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	0.034	0.011	<0.005	0.018	<0.005	<0.005	0.012	<0.005	<0.005	0.062	<0.005	<0.005	1.4	0.0066	0.0099	<0.005	<0.005	<0.005	1.476	1.5875	1.5169	1.462	1.414	<0.01	0.014
S29(0.2-0.4)	22/1/20	<0.005	0.014	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	0.0089	0.0091	<0.005	<0.005	<0.005	<0.005	0.0068	<0.005	<0.005	0.037	<0.005	<0.005	0.8	<0.005	0.0057	<0.005	<0.005	<0.005	0.8462	0.8907	0.875	0.837	0.8092	<0.01	0.0092
S29(0.4-0.6)	22/1/20	<0.005	0.056	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.022	<0.005	<0.005	<0.005	0.0061	0.062	<0.005	0.018	0.22	0.035	<0.005	0.99	0.026	0.014	<0.005	<0.005	<0.005	1.32	1.5591	1.43	1.21	1.1	<0.01	0.11
S29(0.6-0.8)	22/1/20	<0.005	0.077	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.059	<0.005	<0.005	<0.005	0.011	0.018	<0.005	0.034	0.38	0.0053	<0.005	0.64	0.059	0.016	<0.005	<0.005	<0.005	1.063	1.3423	1.249	1.02	0.683	<0.01	0.043
S29(0.8-1.0)	22/1/20	<0.005	0.05	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.048	<0.005	<0.005	<0.005	0.0099	0.011	<0.005	0.017	0.17	<0.005	<0.005	0.22	0.039	0.011	<0.005	<0.005	<0.005	0.413	0.5989	0.539	0.39	0.243	<0.01	0.023
S30(0.0-0.2)	22/1/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0095	<0.005	<0.005	0.34	<0.005	<0.005	<0.005	<0.005	<0.005	0.3495	0.3495	0.3495	0.3495	0.34	<0.01	<0.005
S30(0.2-0.4)	22/1/20	<0.005	0.0100	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.013	<0.005	0.0067	0.042	<0.005	<0.005	0.53	<0.005	0.0080	<0.005	<0.005	<0.005	0.597	0.6347	0.6217	0.572	0.555	<0.01	0.025
S30(0.4-0.6)	22/1/20	<0.005	0.012	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.015	<0.005	0.0072	0.053	<0.005	<0.005	0.49	<0.005	0.0078	<0.005	<0.005	<0.005	0.57	0.612	0.597	0.543	0.517	<0.01	0.027
S30(0.6-0.8)	22/1/20	<0.005	0.0096	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0058	<0.005	0.0059	0.055	<0.005	<0.005	0.38	<0.005	0.0051	<0.005	<0.005	<0.005	0.4447	0.4711	0.4653	0.435	0.3897	<0.01	0.0097
S31(0.0-0.2)	22/1/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.031	<0.005	<0.005	<0.005	<0.005	<0.005	0.031	<0.05	0.031	0.031	0.031	<0.01	<0.005
S31(0.2-0.4)	22/1/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
S32(0.0-0.2)	22/1/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0084	<0.005	<0.005	0.021	<0.005	<0.005	0.98	<0.005	<0.005	<0.005	<0.005	<0.005	1.001	1.0094	1.001	1.001	0.98	<0.01	<0.005
S32(0.2-0.4)	22/1/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0081	<0.005	<0.005	0.024	<0.005	<0.005	0.92	<0.005	<0.005	<0.005	<0.005	<0.005	0.944	0.9521	0.944	0.944	0.92	<0.01	<0.005
S33(0.0-0.2)	22/1/20	<0.005	0.025	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.0100	<0.005	<0.005	<0.005	<0.005	0.1	<0.005	0.0090	0.15	<0.005	<0.005	2.5	0.0099	0.0064	<0.005	<0.005	<0.005	2.719	2.8793	2.7694	2.65	2.569	<0.01	0.069
S33(0.2-0.4)	22/1/20	<0.005	0.014	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	0.014	0.015	<0.005	<0.005	<0.005	0.0050	0.021	<0.005	<0.005	0.11	<0.005	<0.005	2.4	0.0089	<0.005	<0.005	<0.005	<0.005	2.525	2.6029	2.554	2.51	2.415	<0.01	0.015
S33A(0.6-0.8)	22/1/20	<0.005	0.059	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.049	<0.005	<0.005	<0.005	0.02	0.055	<0.005	0.016	0.45	<0.005	<0.005	0.69	0.054	0.0078	<0.005	<0.005	<0.005	1.187	1.4478	1.3188	1.14	0.737	<0.01	0.047
S34_0.0-0.2	19/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.38	<0.005	<0.005	<0.005	<0.005	<0.005	0.38	0.38	0.38	0.38	0.38	<0.01	<0.005
S34_0.2-0.4	19/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0055	<0.005	<0.005	0.27	<0.005	<0.005	<0.005	<0.005	<0.005	0.2755	0.2755	0.2755	0.2755	0.27	<0.01	<0.005
SD02	17/1/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
SD05	17/1/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0054	<0.005	<0.005	<0.005	<0.005	<0.005	0.0054	<0.05	<0.01	0.0054	0.0054	<0.01	<0.005
SD10	16/3/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0062	<0.005	<0.005	<0.005	<0.005	<0.005	0.0062	<0.05	<0.01	0.0062	0.0062	<0.01	<0.005
TARRO_PIT 1	20/2/20	<0.005	<0.005	<0.005	<0.005	0.0052	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.016	<0.005	<0.005	<0.005	<0.005	<0.005	0.016	<0.05	0.016	0.016	0.016	<0.01	<0.005
TARRO_PIT 2	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.034	<0.005	<0.005	<0.005	<0.005	<0.005	0.034	<0.05	0.034	0.034	0.034	<0.01	<0.005

Environmental Standards

HEPA, Jan 2018, PFAS NEMP 2018 Table 2 Health Public open space
HEPA, Jan 2018, PFAS NEMP 2018 Table 2 Health Residential accessible soil
HEPA, Jan 2018, PFAS NEMP 2018 Table 3 Interim EDE Public open space
HEPA, Jan 2018, PFAS NEMP 2018 Table 3 Interim EIE Residential

PFOS/PFOA

Field ID	Date	Perfluorodecanoic acid (PFDA)	Perfluorohexanoic acid (PFHxA)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-ethylperfluorooctanesulfonamidoethanol (NEtFOSE)	N-Methyl perfluorooctane sulfonamide (NMeFOSA)	N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	N-Methylperfluorooctanesulfonamidoethanol (N-	Perfluorononanesulfonic acid (PFNS)(trace)	Perfluorobutane sulfonic acid (PFBS)	Perfluorobutanoic acid (PFBA)	Perfluorodecanesulfonic acid (PFDS)	Perfluorododecanoic acid (PFDoDA)	Perfluoropropanesulfonic acid (PFPrS)	Perfluoroheptane sulfonic acid (PFHpS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL		0.01	0.01	0.01	0.01	0.05	0.05	0.05	0.05	0.05	0.05	0.01	0.01	0.05	0.01	0.01	0.01	0.01	0.01
Guidance on Per and Polyfluoroalkyl (PFAS) in Recreational Water																			
PFAS NEMP 2018 Table 1 Health Drinking Water																			
PFAS NEMP 2018 Table 5 Freshwater 95%																			
PFAS NEMP 2018 Table 5 Freshwater 99%																			
MW01	20/2/20	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.00001
MW02	20/2/20	<0.01	0.11	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.06	0.06	<0.01	<0.01	0.02	<0.01	<0.01
MW03	20/2/20	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01
SW01	17/1/20	<0.01	0.34	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.09	0.21	<0.01	<0.01	0.03	0.01	<0.01
SW02	17/1/20	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01
SW03	19/2/20	<0.01	0.02	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01
SW04	19/2/20	<0.01	0.02	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01
SW05	17/1/20	<0.01	0.04	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01
SW06	17/1/20	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01
SW07	19/2/20	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.02	<0.05	<0.01	<0.01	0.01	<0.01	<0.01
SW07A	19/2/20	<0.01	0.03	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01
SW08	17/1/20	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01
SW09	17/1/20	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01
SW10	16/3/20	<0.01	0.16	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.06	0.05	<0.01	<0.01	0.02	0.03	<0.01
TARRO_PIT 1	19/2/20	<0.01	0.05	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.02	<0.05	<0.01	<0.01	0.01	<0.01	<0.01
TARRO_PIT 2	19/2/20	<0.01	0.14	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.10	0.06	<0.01	<0.01	0.05	<0.01	<0.01

Field ID	Date	Perfluoroheptanoic acid (PFHpA)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)	Perfluorooctane sulfonamide (PFOSA)	Perfluorooctanesulfonic acid (PFOS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	Sum of PFAS	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	Perfluorooctanoic acid (PFOA)
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL		0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.1	0.05	0.01	0.01	0.05	0.01
Guidance on Per and Polyfluoroalkyl (PFAS) in Recreational Water															2			10
PFAS NEMP 2018 Table 1 Health Drinking Water															0.07			0.56
PFAS NEMP 2018 Table 5 Freshwater 95%						0.13												220
PFAS NEMP 2018 Table 5 Freshwater 99%						0.00023												19
MW01	20/2/20	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.05	<0.01	<0.01	<0.05	<0.01
MW02	20/2/20	0.02	0.17	<0.01	<0.05	0.09	0.04	0.10	<0.01	<0.01	<0.01	0.27	0.68	0.62	0.26	0.1	<0.05	0.01
MW03	20/2/20	<0.01	0.01	<0.01	<0.05	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.1	<0.05	0.03	0.02	<0.05	<0.01
SW01	17/1/20	0.11	0.20	0.02	<0.05	0.44	0.06	0.80	<0.01	<0.01	<0.01	0.7	2.37	2.25	0.64	0.5	<0.05	0.06
SW02	17/1/20	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.1	<0.05	<0.01	0.01	<0.05	0.01
SW03	19/2/20	<0.01	0.06	<0.01	<0.05	0.08	<0.01	0.02	<0.01	<0.01	<0.01	0.15	0.2	0.2	0.14	0.09	<0.05	0.01
SW04	19/2/20	<0.01	0.06	<0.01	<0.05	0.08	<0.01	0.02	<0.01	<0.01	<0.01	0.14	0.19	0.19	0.14	0.08	<0.05	<0.01
SW05	17/1/20	0.01	0.01	<0.01	<0.05	0.04	<0.01	0.07	<0.01	<0.01	<0.01	0.07	0.19	0.19	0.05	0.06	<0.05	0.02
SW06	17/1/20	<0.01	<0.01	<0.01	<0.05	0.03	<0.01	0.05	<0.01	<0.01	<0.01	0.03	<0.1	0.08	0.03	0.03	<0.05	<0.01
SW07	19/2/20	<0.01	0.03	<0.01	<0.05	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	<0.1	0.07	0.05	0.02	<0.05	<0.01
SW07A	19/2/20	<0.01	0.07	<0.01	<0.05	0.05	<0.01	0.02	<0.01	<0.01	<0.01	0.13	0.19	0.19	0.12	0.06	<0.05	0.01
SW08	17/1/20	<0.01	<0.01	<0.01	<0.05	0.01	<0.01	0.03	<0.01	<0.01	<0.01	0.01	<0.1	<0.05	0.01	0.01	<0.05	<0.01
SW09	17/1/20	<0.01	<0.01	<0.01	<0.05	0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.02	<0.1	<0.05	0.01	0.02	<0.05	0.01
SW10	16/3/20	0.04	0.38	0.02	<0.05	1.2	0.05	0.14	<0.01	<0.01	<0.01	1.62	2.19	2.07	1.58	1.24	<0.05	0.04
TARRO_PIT 1	19/2/20	0.02	0.07	<0.01	<0.05	0.07	0.01	0.03	<0.01	<0.01	<0.01	0.17	0.31	0.29	0.14	0.1	<0.05	0.03
TARRO_PIT 2	19/2/20	0.04	0.34	<0.01	<0.05	0.14	0.06	0.08	<0.01	<0.01	<0.01	0.52	1.05	0.94	0.48	0.18	<0.05	0.04

Environmental Standards

National Health and Medical Research Council, 2019, Guidance on Per and Polyfluoroalkyl (PFAS) in Recreational Water

HEPA, Jan 2018, PFAS NEMP 2018 Table 1 Health Drinking Water

HEPA, Jan 2018, PFAS NEMP 2018 Table 5 Freshwater 95%

HEPA, Jan 2018, PFAS NEMP 2018 Table 5 Freshwater 99%

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		PFAS			
		Sum of PFHxS and PFOS		Perfluorooctanoic acid (PFOA)	
		mg/kg	µg/L	mg/kg	µg/L
EQL		0.0005	0.01	0.0003	0.01
NSW 2014 General Solid Waste SCC1 (with leached)		1.8		18	
NSW 2014 General Solid Waste TCLP1 (leached)			50		500
NSW 2014 Restricted Solid Waste SCC2 (with leached)		7.2		72	
NSW 2014 Restricted Solid Waste TCLP2 (leached)			200		2,000
Field ID	**Date**				
S8 (0.0-0.2)	**30/9/19**	1.09		0.078	
S8 (0.0-0.2)	**30/9/19**		27.2		1.6
S16 (0.2-0.4)	**1/10/19**	2.234		0.01	
S16 (0.2-0.4)	**1/10/19**		60.1		0.26
S16 (0.4-0.6)	**1/10/19**	5.096		0.04	
S16 (0.4-0.6)	**1/10/19**		144.4		2.2
S16A_0.2-0.4	**19/2/20**	2.263			0.019
S16A_0.4-0.6	**19/2/20**	1.952			0.017
S16B_0.2-0.4	**19/2/20**	0.6			0.0060
S16B_0.4-0.6	**19/2/20**	0.632			0.0078
S16C_0.2-0.4	**19/2/20**	0.1758			<0.005
S16C_0.4-0.6	**19/2/20**	0.1598			<0.005
S33(0.2-0.4)	**22/1/20**	2.51		0.015	
S33(0.2-0.4)	**22/1/20**		41.8		0.47
SP4-1_0.1	**23/9/19**	1.12		0.0052	
SP4-1_0.1	**23/9/19**		29.93		0.21
SP4-1_1.0	**23/9/19**	0.294		<0.005	
SP4-1_1.0	**23/9/19**		12		0.17

Environmental Standards
NSW EPA, November 2014

		Heavy Metal									PAH			TPH		Volatile			
		Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Lead	Mercury	Nickel	Zinc	Benzo(a) pyrene	Benzo(a) pyrene	PAHs (Sum of total)	C6-C9	C10-C36 (Sum of total)	Benzene	Toluene	Ethylbenzene	Xylene Total
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL		2	0.4	5	5	5	0.01	0.1	5	5	0.5	0.001	0.5	20	50	0.1	0.1	0.1	0.3
NSW 2014 General Solid Waste CT1		100	20	100		100		4	40		0.8					10	288	600	1000
NSW 2014 General Solid Waste SCC1 (with leached)		500	100			1,500		50	1,050		10		200	650	10,000	18	518	1,080	1,800
NSW 2014 General Solid Waste TCLP1 (leached)							5					0.04							
NSW 2014 Restricted Solid Waste SCC2 (with leached)		2,000	400			6,000		200	4,200		23		800	2,600	40,000	72	2,073	4,320	7,200
NSW 2014 Restricted Solid Waste TCLP2 (leached)							20					0.16							
Field ID	**Date**																		
S7 (0.0-0.2)	**30/9/19**	8.7	0.5	20	71	65		<0.1	12	290	<0.5		0.5	<20	<50	<0.1	<0.1	<0.1	<0.3
S7 (0.4-0.6)	**30/9/19**	5.4	<0.4	29	<5	14		<0.1	6.3	23	<0.5		<0.5	<20	<50	<0.1	<0.1	<0.1	<0.3
S28(0.0-0.2)	**22/1/20**	4.9	<0.4	14	16	75		<0.1	7.6	81	<0.5		<0.5	<20	87	<0.1	<0.1	<0.1	<0.3
S29(0.0-0.2)	**22/1/20**	8.3	<0.4	14	24	77		0.1	17	130	<0.5		1.1	<20	<50	<0.1	<0.1	<0.1	<0.3
S32(0.0-0.2)	**22/1/20**	8.6	0.6	13	63	220		0.2	10	510	<0.5		2.8	<20	119	<0.1	<0.1	<0.1	<0.3
S32(0.0-0.2)	**22/1/20**						0.69					<0.001							
S33(0.0-0.2)	**22/1/20**	4.6	<0.4	21	<5	19		<0.1	5.2	37	<0.5		<0.5	<20	<50	<0.1	<0.1	<0.1	<0.3

Environmental Standards

NSW EPA, November 2014

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Field or Interlab Duplicates

PFOS/PFOA

Lab Report Number	Field ID	Matrix Type	Date	Perfluorodecanoic acid (PFDA)	Perfluorohexanoic acid (PFHxA)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-ethylperfluorooctanesulfonamidoethanol (NEtFOSE)	N-Methyl perfluorooctane sulfonamide (NMeFOSA)	N-methylperfluorooctane sulfonamidoacetic acid	N-Methylperfluorooctanesulfonamidoethanol (N-MeFOSE)	Perfluorononanesulfonic acid (PFNS)(trace)	Perfluorobutane sulfonic acid (PFBS)	Perfluorobutanoic acid (PFBA)	Perfluorodecanesulfonic acid (PFDS)
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL				0.005	0.005	0.005	0.005	0.005	0.01	0.005	0.005	0.01	0.005	0.005	0.005	0.005	0.005
698668	S32(0.0-0.2)	soil	22/1/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005
698668	QC1	soil	22/1/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	0.011	<0.005	<0.005	<0.005
RPD				0	0	0	0	0	0	0	0	0	0	75	0	0	0
703149	S16A_0.4-0.6	soil	19/2/20	<0.005	0.032	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	0.0074	0.0082	0.0078	<0.005
703149	QC4	soil	19/2/20	<0.005	0.05	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	0.013	0.011	0.0083	<0.005
RPD				0	44	0	0	0	0	0	0	0	0	55	29	6	0
703149	FP16_0.0-0.2	soil	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005
703149	QC9	soil	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005
RPD				0	0	0	0	0	0	0	0	0	0	0	0	0	0

Lab Report Number	Field ID	Matrix Type	Date	Perfluorododecanoic acid (PFDoDA)	Perfluoropropanesulfonic acid (PFPrS)	Perfluoroheptane sulfonic acid (PFHpS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)	Perfluorooctane sulfonamide (PFOSA)	Perfluorooctanesulfonic acid (PFOS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	Sum of PFAS	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	Perfluorooctanoic acid (PFOA)
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL				0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.05	0.01	0.005	0.005	0.01	0.005
698668	S32(0.0-0.2)	soil	22/1/20	<0.005	<0.005	0.0084	<0.005	<0.005	0.021	<0.005	<0.005	0.98	<0.005	<0.005	<0.005	<0.005	<0.005	1.001	1.0094	1.001	1.001	0.98	<0.01	<0.005
698668	QC1	soil	22/1/20	<0.005	<0.005	0.0074	<0.005	<0.005	0.02	<0.005	<0.005	1.2	<0.005	<0.005	<0.005	<0.005	<0.005	1.22	1.2384	1.22	1.22	1.2	<0.01	<0.005
RPD				0	0	13	0	0	5	0	0	20	0	0	0	0	0	20	20	20	20	20	0	0
703149	S16A_0.4-0.6	soil	19/2/20	<0.005	<0.005	0.011	<0.005	0.013	0.052	0.018	<0.005	1.9	0.0063	0.04	<0.005	<0.005	<0.005	1.969	2.1127	2.07	1.952	1.917	<0.01	0.017
703149	QC4	soil	19/2/20	<0.005	<0.005	0.027	<0.005	0.024	0.12	0.043	<0.005	2.9	0.0097	0.046	<0.005	<0.005	<0.005	3.061	3.293	3.2003	3.02	2.941	<0.01	0.041
RPD				0	0	84	0	59	79	82	0	42	43	14	0	0	0	43	44	43	43	42	0	83
703149	FP16_0.0-0.2	soil	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
703149	QC9	soil	20/2/20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.01	<0.005	<0.005	<0.01	<0.005
RPD				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*RPDs have only been considered where a concentration is greater than 1 times the EQL.

**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 81 (1 - 10 x EQL); 50 (10 - 30 x EQL); 30 (> 30 x EQL)

***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

nation partners

Attachment 4 – Laboratory Certificates

Nation Partners
306 / 50 Holt Street,
Surry Hills
NSW 2010

NATA Accredited
Accreditation Number 1261
Site Number 20794

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

Attention: **Luke Clements**

Report **697518-S**
Project name FRNSW - TARRA
Project ID NP19039
Received Date Jan 17, 2020

Client Sample ID **Sample Matrix** **Eurofins Sample No.** **Date Sampled** Test/Reference	LOR	Unit	**SD02** **Soil** **B20-Ja15833** **Jan 17, 2020**	**SD05** **Soil** **B20-Ja15834** **Jan 17, 2020**
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	8.2	7.3
Total Organic Carbon	0.1	%	0.4	12
% Moisture	1	%	15	80
Perfluoroalkyl carboxylic acids (PFCAs)				
Perfluorobutanoic acid (PFBA)N11	5	ug/kg	< 5	< 5
Perfluoropentanoic acid (PFPeA)N11	5	ug/kg	< 5	< 5
Perfluorohexanoic acid (PFHxA)N11	5	ug/kg	< 5	< 5
Perfluoroheptanoic acid (PFHpA)N11	5	ug/kg	< 5	< 5
Perfluorooctanoic acid (PFOA)N11	5	ug/kg	< 5	< 5
Perfluorononanoic acid (PFNA)N11	5	ug/kg	< 5	< 5
Perfluorodecanoic acid (PFDA)N11	5	ug/kg	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)N11	5	ug/kg	< 5	< 5
Perfluorododecanoic acid (PFDoDA)N11	5	ug/kg	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)N15	5	ug/kg	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)N11	5	ug/kg	< 5	< 5
13C4-PFBA (surr.)	1	%	85	74
13C5-PFPeA (surr.)	1	%	102	81
13C5-PFHxA (surr.)	1	%	86	75
13C4-PFHpA (surr.)	1	%	83	84
13C8-PFOA (surr.)	1	%	89	86
13C5-PFNA (surr.)	1	%	91	83
13C6-PFDA (surr.)	1	%	107	97
13C2-PFUnDA (surr.)	1	%	114	103
13C2-PFDoDA (surr.)	1	%	114	102
13C2-PFTeDA (surr.)	1	%	122	98
Perfluoroalkyl sulfonamido substances				
Perfluorooctane sulfonamide (FOSA)N11	5	ug/kg	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)N11	5	ug/kg	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)N11	5	ug/kg	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)N11	5	ug/kg	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)N11	5	ug/kg	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)N11	10	ug/kg	< 10	< 10

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Client Sample ID			SD02	SD05
Sample Matrix			Soil	Soil
Eurofins Sample No.			B20-Ja15833	B20-Ja15834
Date Sampled			Jan 17, 2020	Jan 17, 2020
Test/Reference	LOR	Unit		
Perfluoroalkyl sulfonamido substances				
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10
13C8-FOSA (surr.)	1	%	81	70
D3-N-MeFOSA (surr.)	1	%	80	68
D5-N-EtFOSA (surr.)	1	%	88	76
D7-N-MeFOSE (surr.)	1	%	95	75
D9-N-EtFOSE (surr.)	1	%	72	62
D5-N-EtFOSAA (surr.)	1	%	84	78
D3-N-MeFOSAA (surr.)	1	%	80	66
Perfluoroalkyl sulfonic acids (PFSAs)				
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	< 5	< 5
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	< 5	5.4
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5
13C3-PFBS (surr.)	1	%	87	74
18O2-PFHxS (surr.)	1	%	85	82
13C8-PFOS (surr.)	1	%	78	80
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N15]	5	ug/kg	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	65	88
13C2-6:2 FTSA (surr.)	1	%	132	124
13C2-8:2 FTSA (surr.)	1	%	85	80
PFASs Summations				
Sum (PFHxS + PFOS)*	5	ug/kg	< 5	5.4
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	< 5	5.4
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	< 5	5.4
Sum of WA DWER PFAS (n=10)*	10	ug/kg	< 10	< 10
Sum of PFASs (n=30)*	50	ug/kg	< 50	< 50

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Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

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

Description	Testing Site	Extracted	Holding Time
pH (1:5 Aqueous extract at 25°C as rec.)	Melbourne	Jan 23, 2020	7 Days
- Method: LTM-GEN-7090 pH in soil by ISE			
Total Organic Carbon	Melbourne	Jan 23, 2020	28 Days
- Method: LTM-INO-4060 Total Organic Carbon in water and soil			
% Moisture	Brisbane	Jan 20, 2020	14 Days
- Method: LTM-GEN-7080 Moisture			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Jan 20, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Jan 20, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Jan 20, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Jan 20, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

Company Name:	Nation Partners Pty Ltd	**Order No.:**		**Received:**	Jan 17, 2020 3:00 PM
Address:	306 / 50 Holt Street, Surry Hills NSW 2010	**Report #:**	697518	**Due:**	Jan 24, 2020
		Phone:	0405 821 580	**Priority:**	5 Day
		Fax:		**Contact Name:**	Luke Clements
Project Name:	FRNSW - TARRA				
Project ID:	NP19039				

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	Total Organic Carbon	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X		
Sydney Laboratory - NATA Site # 18217									
Brisbane Laboratory - NATA Site # 20794								X	X
Perth Laboratory - NATA Site # 23736									
External Laboratory									
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**				
1	SW01	Jan 17, 2020		Water	B20-Ja15827				X
2	SW02	Jan 17, 2020		Water	B20-Ja15828				X
3	SW05	Jan 17, 2020		Water	B20-Ja15829				X
4	SW06	Jan 17, 2020		Water	B20-Ja15830				X
5	SW08	Jan 17, 2020		Water	B20-Ja15831				X
6	SW09	Jan 17, 2020		Water	B20-Ja15832				X
7	SD02	Jan 17, 2020		Soil	B20-Ja15833	X	X	X	X
8	SD05	Jan 17, 2020		Soil	B20-Ja15834	X	X	X	X
Test Counts						2	2	2	8

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Organic Carbon	%	< 0.1			0.1	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/kg	< 5			5	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/kg	< 5			5	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/kg	< 5			5	Pass	
LCS - % Recovery							
Total Organic Carbon	%	93			70-130	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	102			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	87			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	104			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	110			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	103			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	98			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	101			50-150	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluoroundecanoic acid (PFUnDA)	%	111			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	98			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	115			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	107			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	99			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	103			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	99			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	92			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	94			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	104			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	101			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	89			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	118			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	110			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	108			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	102			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	111			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	106			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	107			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	105			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	79			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	106			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	88			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	M20-Ja13757	NCP	%	101			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M20-Ja13757	NCP	%	95			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M20-Ja13757	NCP	%	102			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M20-Ja13757	NCP	%	103			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M20-Ja13757	NCP	%	100			50-150	Pass	
Perfluorononanoic acid (PFNA)	M20-Ja13757	NCP	%	107			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M20-Ja13757	NCP	%	101			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M20-Ja13757	NCP	%	108			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M20-Ja13757	NCP	%	112			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M20-Ja13757	NCP	%	101			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M20-Ja13757	NCP	%	108			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	M20-Ja13757	NCP	%	112			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M20-Ja13757	NCP	%	109			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M20-Ja13757	NCP	%	103			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M20-Ja13757	NCP	%	97			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M20-Ja13757	NCP	%	101			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M20-Ja13757	NCP	%	102			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M20-Ja13757	NCP	%	105			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M20-Ja13757	NCP	%	97			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	M20-Ja13757	NCP	%	122			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M20-Ja13757	NCP	%	100			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M20-Ja13757	NCP	%	109			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M20-Ja13757	NCP	%	95			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M20-Ja13757	NCP	%	106			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M20-Ja13757	NCP	%	104			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M20-Ja13757	NCP	%	126			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M20-Ja13757	NCP	%	98			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	M20-Ja13757	NCP	%	106			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M20-Ja13757	NCP	%	102			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M20-Ja13757	NCP	%	96			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
pH (1:5 Aqueous extract at 25°C as rec.)	M20-Ja17749	NCP	pH Units	8.6	8.6	pass	30%	Pass	
% Moisture	B20-Ja15383	NCP	%	58	59	1.0	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	B20-Ja13645	NCP	ug/kg	< 5	5.4	8.0	30%	Pass	
Perfluoropentanoic acid (PFPeA)	B20-Ja13645	NCP	ug/kg	9.3	8.4	10	30%	Pass	
Perfluorohexanoic acid (PFHxA)	B20-Ja13645	NCP	ug/kg	29	35	17	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	B20-Ja13645	NCP	ug/kg	89	86	3.0	30%	Pass	
Perfluorooctanoic acid (PFOA)	M20-Ja15864	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	B20-Ja13645	NCP	ug/kg	330	360	7.0	30%	Pass	
Perfluorodecanoic acid (PFDA)	B20-Ja13645	NCP	ug/kg	260	280	6.0	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	B20-Ja13645	NCP	ug/kg	85	90	6.0	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	B20-Ja13645	NCP	ug/kg	76	76	<1	30%	Pass	

Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorotridecanoic acid (PFTrDA)	B20-Ja13645	NCP	ug/kg	22	21	4.0	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	B20-Ja13645	NCP	ug/kg	13	13	2.0	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	M20-Ja15864	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M20-Ja15864	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B20-Ja13645	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	B20-Ja13645	NCP	ug/kg	150	170	10	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	B20-Ja13645	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B20-Ja13645	NCP	ug/kg	120	110	11	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M20-Ja15864	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	B20-Ja13645	NCP	ug/kg	14	15	9.0	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	B20-Ja13645	NCP	ug/kg	52	57	9.0	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	B20-Ja13645	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	B20-Ja13645	NCP	ug/kg	24	25	7.0	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	B20-Ja13645	NCP	ug/kg	160	180	11	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	B20-Ja13645	NCP	ug/kg	100	110	9.0	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	M20-Ja15864	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	B20-Ja13645	NCP	ug/kg	15	15	2.0	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	B20-Ja13645	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	B20-Ja13645	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	B20-Ja13645	NCP	ug/kg	340	290	15	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M20-Ja15864	NCP	ug/kg	< 5	< 5	<1	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

Ursula Long	Analytical Services Manager
Julie Kay	Senior Analyst-Inorganic (VIC)
Sarah McCallion	Senior Analyst-PFAS (QLD)
Scott Beddoes	Senior Analyst-Inorganic (VIC)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please click here.

eurofins Environment Testing

Certificate of Analysis

Nation Partners
306 / 50 Holt Street,
Surry Hills
NSW 2010

NATA Accredited
Accreditation Number 1261
Site Number 20794

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

Attention: **Luke Clements**

Report	**697518-W**
Project name	FRNSW - TARRA
Project ID	NP19039
Received Date	Jan 17, 2020

Client Sample ID			**SW01**	**SW02**	**SW05**	**SW06**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins Sample No.			**B20-Ja15827**	**B20-Ja15828**	**B20-Ja15829**	**B20-Ja15830**
Date Sampled			**Jan 17, 2020**	**Jan 17, 2020**	**Jan 17, 2020**	**Jan 17, 2020**
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	0.05	ug/L	0.21	< 0.05	< 0.05	< 0.05
Perfluoropentanoic acid (PFPeA)[N11]	0.01	ug/L	0.80	< 0.01	0.07	0.05
Perfluorohexanoic acid (PFHxA)[N11]	0.01	ug/L	0.34	< 0.01	0.04	< 0.01
Perfluoroheptanoic acid (PFHpA)[N11]	0.01	ug/L	0.11	< 0.01	0.01	< 0.01
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	[N09]0.06	0.01	0.02	< 0.01
Perfluorononanoic acid (PFNA)[N11]	0.01	ug/L	0.02	< 0.01	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTrDA)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	100	132	105	91
13C5-PFPeA (surr.)	1	%	46	68	61	51
13C5-PFHxA (surr.)	1	%	60	74	61	60
13C4-PFHpA (surr.)	1	%	73	86	75	77
13C8-PFOA (surr.)	1	%	77	90	74	75
13C5-PFNA (surr.)	1	%	106	115	102	100
13C6-PFDA (surr.)	1	%	112	124	115	119
13C2-PFUnDA (surr.)	1	%	103	102	100	99
13C2-PFDoDA (surr.)	1	%	91	72	78	72
13C2-PFTeDA (surr.)	1	%	130	62	66	63
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	90	94	92	86
D3-N-MeFOSA (surr.)	1	%	95	83	53	50
D5-N-EtFOSA (surr.)	1	%	92	76	50	47

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Client Sample ID			SW01	SW02	SW05	SW06
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			B20-Ja15827	B20-Ja15828	B20-Ja15829	B20-Ja15830
Date Sampled			Jan 17, 2020	Jan 17, 2020	Jan 17, 2020	Jan 17, 2020
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonamido substances						
D7-N-MeFOSE (surr.)	1	%	81	88	66	69
D9-N-EtFOSE (surr.)	1	%	75	73	60	57
D5-N-EtFOSAA (surr.)	1	%	96	96	112	129
D3-N-MeFOSAA (surr.)	1	%	86	88	101	100
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)N11	0.01	ug/L	0.09	< 0.01	< 0.01	< 0.01
Perfluorononanesulfonic acid (PFNS)N15	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS)N15	0.01	ug/L	0.03	< 0.01	< 0.01	< 0.01
Perfluoropentanesulfonic acid (PFPeS)N15	0.01	ug/L	0.06	< 0.01	< 0.01	< 0.01
Perfluorohexanesulfonic acid (PFHxS)N11	0.01	ug/L	N09 0.20	< 0.01	N09 0.01	< 0.01
Perfluoroheptanesulfonic acid (PFHpS)N15	0.01	ug/L	N09 0.01	< 0.01	< 0.01	< 0.01
Perfluorooctanesulfonic acid (PFOS)N11	0.01	ug/L	N09 0.44	< 0.01	N09 0.04	N09 0.03
Perfluorodecanesulfonic acid (PFDS)N15	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	118	138	122	122
18O2-PFHxS (surr.)	1	%	109	133	129	133
13C8-PFOS (surr.)	1	%	81	98	89	91
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)N11	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)N11	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)N11	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)N15	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C2-4:2 FTSA (surr.)	1	%	49	64	65	58
13C2-6:2 FTSA (surr.)	1	%	100	114	123	126
13C2-8:2 FTSA (surr.)	1	%	107	111	128	128
PFASs Summations						
Sum (PFHxS + PFOS)*	0.01	ug/L	0.64	< 0.01	0.05	0.03
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	0.5	0.01	0.06	0.03
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	0.7	0.01	0.07	0.03
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	2.25	< 0.05	0.19	0.08
Sum of PFASs (n=30)*	0.1	ug/L	2.37	< 0.1	0.19	< 0.1

Client Sample ID			SW08	SW09
Sample Matrix			Water	Water
Eurofins Sample No.			B20-Ja15831	B20-Ja15832
Date Sampled			Jan 17, 2020	Jan 17, 2020
Test/Reference	LOR	Unit		
Perfluoroalkyl carboxylic acids (PFCAs)				
Perfluorobutanoic acid (PFBA)N11	0.05	ug/L	< 0.05	< 0.05
Perfluoropentanoic acid (PFPeA)N11	0.01	ug/L	0.03	0.02
Perfluorohexanoic acid (PFHxA)N11	0.01	ug/L	< 0.01	< 0.01
Perfluoroheptanoic acid (PFHpA)N11	0.01	ug/L	< 0.01	< 0.01
Perfluorooctanoic acid (PFOA)N11	0.01	ug/L	< 0.01	0.01
Perfluorononanoic acid (PFNA)N11	0.01	ug/L	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA)N11	0.01	ug/L	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA)N11	0.01	ug/L	< 0.01	< 0.01

Eurofins Environment Testing

Client Sample ID			SW08	SW09
Sample Matrix			Water	Water
Eurofins Sample No.			B20-Ja15831	B20-Ja15832
Date Sampled			Jan 17, 2020	Jan 17, 2020
Test/Reference	LOR	Unit		
Perfluoroalkyl carboxylic acids (PFCAs)				
Perfluorododecanoic acid (PFDoDA)N11	0.01	ug/L	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTrDA)N15	0.01	ug/L	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA)N11	0.01	ug/L	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	92	116
13C5-PFPeA (surr.)	1	%	53	60
13C5-PFHxA (surr.)	1	%	53	68
13C4-PFHpA (surr.)	1	%	68	76
13C8-PFOA (surr.)	1	%	73	81
13C5-PFNA (surr.)	1	%	94	99
13C6-PFDA (surr.)	1	%	115	118
13C2-PFUnDA (surr.)	1	%	95	95
13C2-PFDoDA (surr.)	1	%	64	66
13C2-PFTeDA (surr.)	1	%	59	65
Perfluoroalkyl sulfonamido substances				
Perfluorooctane sulfonamide (FOSA)N11	0.05	ug/L	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)N11	0.05	ug/L	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)N11	0.05	ug/L	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)N11	0.05	ug/L	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)N11	0.05	ug/L	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)N11	0.05	ug/L	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)N11	0.05	ug/L	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	82	82
D3-N-MeFOSA (surr.)	1	%	37	30
D5-N-EtFOSA (surr.)	1	%	39	34
D7-N-MeFOSE (surr.)	1	%	52	47
D9-N-EtFOSE (surr.)	1	%	44	40
D5-N-EtFOSAA (surr.)	1	%	153	129
D3-N-MeFOSAA (surr.)	1	%	94	93
Perfluoroalkyl sulfonic acids (PFSAs)				
Perfluorobutanesulfonic acid (PFBS)N11	0.01	ug/L	< 0.01	< 0.01
Perfluorononanesulfonic acid (PFNS)N15	0.01	ug/L	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS)N15	0.01	ug/L	< 0.01	< 0.01
Perfluoropentanesulfonic acid (PFPeS)N15	0.01	ug/L	< 0.01	< 0.01
Perfluorohexanesulfonic acid (PFHxS)N11	0.01	ug/L	< 0.01	< 0.01
Perfluoroheptanesulfonic acid (PFHpS)N15	0.01	ug/L	< 0.01	< 0.01
Perfluorooctanesulfonic acid (PFOS)N11	0.01	ug/L	N09 0.01	N09 0.01
Perfluorodecanesulfonic acid (PFDS)N15	0.01	ug/L	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	124	126
18O2-PFHxS (surr.)	1	%	130	133
13C8-PFOS (surr.)	1	%	85	90

Client Sample ID			SW08	SW09
Sample Matrix			Water	Water
Eurofins Sample No.			B20-Ja15831	B20-Ja15832
Date Sampled			Jan 17, 2020	Jan 17, 2020
Test/Reference	LOR	Unit		
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)N11	0.01	ug/L	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)N11	0.05	ug/L	< 0.05	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)N11	0.01	ug/L	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)N15	0.01	ug/L	< 0.01	< 0.01
13C2-4:2 FTSA (surr.)	1	%	54	65
13C2-6:2 FTSA (surr.)	1	%	121	123
13C2-8:2 FTSA (surr.)	1	%	126	131
PFASs Summations				
Sum (PFHxS + PFOS)*	0.01	ug/L	0.01	0.01
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	0.01	0.02
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	0.01	0.02
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	< 0.05	< 0.05
Sum of PFASs (n=30)*	0.1	ug/L	< 0.1	< 0.1

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

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

Description	Testing Site	Extracted	Holding Time
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Jan 20, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Jan 20, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Jan 20, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Jan 20, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

Australia

Melbourne 6 Monterey Road Dandenong South VIC 3175 Phone : +61 3 8564 5000 NATA # 1261 Site # 1254 & 14271

Sydney Unit F3, Building F 16 Mars Road Lane Cove West NSW 2066 Phone : +61 2 9900 8400 NATA # 1261 Site # 18217

Brisbane 1/21 Smallwood Place Murarrie QLD 4172 Phone : +61 7 3902 4600 NATA # 1261 Site # 20794

Perth 2/91 Leach Highway Kewdale WA 6105 Phone : +61 8 9251 9600 NATA # 1261 Site # 23736

New Zealand

Auckland 35 O'Rorke Road Penrose, Auckland 1061 Phone : +64 9 526 45 51 IANZ # 1327

Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 Phone : 0800 856 450 IANZ # 1290

Company Name: Nation Partners Pty Ltd
Address: 306 / 50 Holt Street, Surry Hills NSW 2010

Project Name: FRNSW - TARRA
Project ID: NP19039

Order No.:
Report #: 697518
Phone: 0405 821 580
Fax:

Received: Jan 17, 2020 3:00 PM
Due: Jan 24, 2020
Priority: 5 Day
Contact Name: Luke Clements

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	Total Organic Carbon	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X		
Sydney Laboratory - NATA Site # 18217									
Brisbane Laboratory - NATA Site # 20794								X	X
Perth Laboratory - NATA Site # 23736									
External Laboratory									
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**				
1	SW01	Jan 17, 2020		Water	B20-Ja15827				X
2	SW02	Jan 17, 2020		Water	B20-Ja15828				X
3	SW05	Jan 17, 2020		Water	B20-Ja15829				X
4	SW06	Jan 17, 2020		Water	B20-Ja15830				X
5	SW08	Jan 17, 2020		Water	B20-Ja15831				X
6	SW09	Jan 17, 2020		Water	B20-Ja15832				X
7	SD02	Jan 17, 2020		Soil	B20-Ja15833	X	X	X	X
8	SD05	Jan 17, 2020		Soil	B20-Ja15834	X	X	X	X
Test Counts						2	2	2	8

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	83			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	97			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	80			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	87			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	89			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	83			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	82			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	94			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	84			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	75			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	83			50-150	Pass	

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Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	79			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	75			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	64			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	121			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	87			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	84			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	88			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	68			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	84			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	78			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	88			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	71			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	66			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	88			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	75			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	88			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	84			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	B20-Ja13352	NCP	%	91			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	B20-Ja13352	NCP	%	111			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	B20-Ja13352	NCP	%	107			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	B20-Ja13352	NCP	%	103			50-150	Pass	
Perfluorooctanoic acid (PFOA)	B20-Ja13352	NCP	%	110			50-150	Pass	
Perfluorononanoic acid (PFNA)	B20-Ja13352	NCP	%	90			50-150	Pass	
Perfluorodecanoic acid (PFDA)	B20-Ja13352	NCP	%	89			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	B20-Ja13352	NCP	%	89			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	B20-Ja13352	NCP	%	64			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	B20-Ja13352	NCP	%	68			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	B20-Ja13352	NCP	%	64			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	B20-Ja13352	NCP	%	94			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	B20-Ja13352	NCP	%	87			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B20-Ja13352	NCP	%	70			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	B20-Ja13352	NCP	%	115			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	B20-Ja13352	NCP	%	85			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B20-Ja13352	NCP	%	60			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	B20-Ja13352	NCP	%	123			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	B20-Ja13352	NCP	%	109			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	B20-Ja13352	NCP	%	62			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	B20-Ja13352	NCP	%	84			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	B20-Ja13352	NCP	%	111			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	B20-Ja13352	NCP	%	82			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	B20-Ja13352	NCP	%	88			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	B20-Ja13352	NCP	%	99			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	B20-Ja13352	NCP	%	81			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	B20-Ja13352	NCP	%	89			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	B20-Ja13352	NCP	%	85			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	B20-Ja13352	NCP	%	72			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	B20-Ja13352	NCP	%	87			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	S20-Ja14029	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

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Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	S20-Ja14029	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S20-Ja14029	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S20-Ja14029	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S20-Ja14029	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S20-Ja14029	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S20-Ja14029	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S20-Ja14029	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S20-Ja14029	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S20-Ja14029	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

Ursula Long	Analytical Services Manager
Sarah McCallion	Senior Analyst-PFAS (QLD)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please click here.

Nation Partners
306 / 50 Holt Street,
Surry Hills
NSW 2010

Attention: **Luke Clements**

Report **698668-S**
Project name NP19039
Project ID FRNSW-TARRO
Received Date Jan 24, 2020

Client Sample ID			S28(0.0-0.2)	S28(0.2-0.4)	S29(0.0-0.2)	S29(0.2-0.4)
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M20-Ja25610	M20-Ja25611	M20-Ja25615	M20-Ja25616
Date Sampled			Jan 22, 2020	Jan 22, 2020	Jan 22, 2020	Jan 22, 2020
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	-	< 20	-
TRH C10-C14	20	mg/kg	< 20	-	< 20	-
TRH C15-C28	50	mg/kg	< 50	-	< 50	-
TRH C29-C36	50	mg/kg	87	-	< 50	-
TRH C10-C36 (Total)	50	mg/kg	87	-	< 50	-
BTEX						
Benzene	0.1	mg/kg	< 0.1	-	< 0.1	-
Toluene	0.1	mg/kg	< 0.1	-	< 0.1	-
Ethylbenzene	0.1	mg/kg	< 0.1	-	< 0.1	-
m&p-Xylenes	0.2	mg/kg	< 0.2	-	< 0.2	-
o-Xylene	0.1	mg/kg	< 0.1	-	< 0.1	-
Xylenes - Total	0.3	mg/kg	< 0.3	-	< 0.3	-
4-Bromofluorobenzene (surr.)	1	%	54	-	54	-
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	-	< 0.5	-
TRH C6-C10	20	mg/kg	< 20	-	< 20	-
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	-	< 20	-
TRH >C10-C16	50	mg/kg	< 50	-	< 50	-
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	-	< 50	-
TRH >C16-C34	100	mg/kg	< 100	-	< 100	-
TRH >C34-C40	100	mg/kg	< 100	-	< 100	-
TRH >C10-C40 (total)*	100	mg/kg	< 100	-	< 100	-
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	-	< 0.5	-
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	-	0.6	-
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	-	1.2	-
Acenaphthene	0.5	mg/kg	< 0.5	-	< 0.5	-
Acenaphthylene	0.5	mg/kg	< 0.5	-	< 0.5	-
Anthracene	0.5	mg/kg	< 0.5	-	< 0.5	-
Benz(a)anthracene	0.5	mg/kg	< 0.5	-	< 0.5	-
Benzo(a)pyrene	0.5	mg/kg	< 0.5	-	< 0.5	-
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	-	< 0.5	-
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	-	< 0.5	-
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	-	< 0.5	-
Chrysene	0.5	mg/kg	< 0.5	-	< 0.5	-

Client Sample ID			S28(0.0-0.2)	S28(0.2-0.4)	S29(0.0-0.2)	S29(0.2-0.4)
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M20-Ja25610	M20-Ja25611	M20-Ja25615	M20-Ja25616
Date Sampled			Jan 22, 2020	Jan 22, 2020	Jan 22, 2020	Jan 22, 2020
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	-	< 0.5	-
Fluoranthene	0.5	mg/kg	< 0.5	-	0.6	-
Fluorene	0.5	mg/kg	< 0.5	-	< 0.5	-
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	-	< 0.5	-
Naphthalene	0.5	mg/kg	< 0.5	-	< 0.5	-
Phenanthrene	0.5	mg/kg	< 0.5	-	< 0.5	-
Pyrene	0.5	mg/kg	< 0.5	-	0.5	-
Total PAH*	0.5	mg/kg	< 0.5	-	1.1	-
2-Fluorobiphenyl (surr.)	1	%	91	-	90	-
p-Terphenyl-d14 (surr.)	1	%	96	-	99	-
Heavy Metals						
Arsenic	2	mg/kg	4.9	-	8.3	-
Cadmium	0.4	mg/kg	< 0.4	-	< 0.4	-
Chromium	5	mg/kg	14	-	14	-
Copper	5	mg/kg	16	-	24	-
Lead	5	mg/kg	75	-	77	-
Mercury	0.1	mg/kg	< 0.1	-	0.1	-
Nickel	5	mg/kg	7.6	-	17	-
Zinc	5	mg/kg	81	-	130	-
% Moisture	1	%	14	19.51	18	14
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	6.2	< 5	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	11	27	9.9	5.7
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5	20	[N09]20	[N09]14
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5	27	< 5	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5	[N09]12	[N09]14	[N09]9.2
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	68	72	60	72
13C5-PFPeA (surr.)	1	%	72	70	62	75
13C5-PFHxA (surr.)	1	%	74	75	60	71
13C4-PFHpA (surr.)	1	%	70	65	58	66
13C8-PFOA (surr.)	1	%	69	72	59	70
13C5-PFNA (surr.)	1	%	89	92	71	91
13C6-PFDA (surr.)	1	%	116	98	87	99
13C2-PFUnDA (surr.)	1	%	108	92	93	125
13C2-PFDoDA (surr.)	1	%	104	94	87	120
13C2-PFTeDA (surr.)	1	%	97	96	86	113

Client Sample ID			S28(0.0-0.2)	S28(0.2-0.4)	S29(0.0-0.2)	S29(0.2-0.4)
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M20-Ja25610	M20-Ja25611	M20-Ja25615	M20-Ja25616
Date Sampled			Jan 22, 2020	Jan 22, 2020	Jan 22, 2020	Jan 22, 2020
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	67	61	59	71
D3-N-MeFOSA (surr.)	1	%	88	86	81	98
D5-N-EtFOSA (surr.)	1	%	103	91	89	111
D7-N-MeFOSE (surr.)	1	%	91	84	78	98
D9-N-EtFOSE (surr.)	1	%	74	71	60	90
D5-N-EtFOSAA (surr.)	1	%	87	83	74	96
D3-N-MeFOSAA (surr.)	1	%	90	91	74	94
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5	< 5	11	9.1
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	< 5	[N09]34	[N09]8.9
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5	< 5	6.6	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	[N09]< 5	[N09]34	[N09]62	[N09]37
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5	< 5	[N09]12	[N09]6.8
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]62	[N09]180	[N09]1400	[N09]800
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5	18	< 5
13C3-PFBS (surr.)	1	%	91	92	77	98
18O2-PFHxS (surr.)	1	%	93	78	72	95
13C8-PFOS (surr.)	1	%	93	85	108	109
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	47	77	37	37
13C2-6:2 FTSA (surr.)	1	%	56	69	41	46
13C2-8:2 FTSA (surr.)	1	%	83	92	69	86
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	62	214	1462	837
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	62	192	1414	809.2
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	62	226	1476	846.2
Sum of WA DWER PFAS (n=10)*	10	ug/kg	73	306.2	1516.9	875
Sum of PFASs (n=30)*	50	ug/kg	73	306.2	1587.5	890.7

Client Sample ID			S30(0.0-0.2)	S30(0.2-0.4)	S31(0.0-0.2)	S31(0.2-0.4)
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M20-Ja25620	M20-Ja25621	M20-Ja25624	M20-Ja25625
Date Sampled			Jan 22, 2020	Jan 22, 2020	Jan 22, 2020	Jan 22, 2020
Test/Reference	LOR	Unit				
% Moisture	1	%	17	25	16	23
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5	8.0	< 5	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5	[N09]10.0	< 5	< 5
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5	6.7	< 5	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5	[N09]25	< 5	< 5
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	70	72	65	70
13C5-PFPeA (surr.)	1	%	75	72	69	70
13C5-PFHxA (surr.)	1	%	76	75	68	72
13C4-PFHpA (surr.)	1	%	67	70	59	64
13C8-PFOA (surr.)	1	%	69	68	67	70
13C5-PFNA (surr.)	1	%	87	85	79	90
13C6-PFDA (surr.)	1	%	108	97	109	111
13C2-PFUnDA (surr.)	1	%	105	104	100	111
13C2-PFDoDA (surr.)	1	%	106	104	98	110
13C2-PFTeDA (surr.)	1	%	107	98	99	108
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	63	67	64	74
D3-N-MeFOSA (surr.)	1	%	88	77	88	100
D5-N-EtFOSA (surr.)	1	%	99	97	99	114
D7-N-MeFOSE (surr.)	1	%	84	89	82	102
D9-N-EtFOSE (surr.)	1	%	72	81	73	90
D5-N-EtFOSAA (surr.)	1	%	85	76	80	79
D3-N-MeFOSAA (surr.)	1	%	84	77	79	72
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	[N09]9.5	[N09]42	< 5	< 5
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5	[N09]13	< 5	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]340	[N09]530	[N09]31	< 5

Eurofins Environment Testing

Client Sample ID			S30(0.0-0.2)	S30(0.2-0.4)	S31(0.0-0.2)	S31(0.2-0.4)
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M20-Ja25620	M20-Ja25621	M20-Ja25624	M20-Ja25625
Date Sampled			Jan 22, 2020	Jan 22, 2020	Jan 22, 2020	Jan 22, 2020
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	96	89	88	97
18O2-PFHxS (surr.)	1	%	95	83	86	100
13C8-PFOS (surr.)	1	%	79	114	86	102
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	51	56	37	35
13C2-6:2 FTSA (surr.)	1	%	63	56	48	35
13C2-8:2 FTSA (surr.)	1	%	79	91	69	73
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	349.5	572	31	< 5
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	340	555	31	< 5
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	349.5	597	31	< 5
Sum of WA DWER PFAS (n=10)*	10	ug/kg	349.5	621.7	31	< 10
Sum of PFASs (n=30)*	50	ug/kg	349.5	634.7	< 50	< 50

Client Sample ID			S32(0.0-0.2)	S32(0.2-0.4)	S33(0.2-0.4)	S33(0.0-0.2)
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M20-Ja25628	M20-Ja25629	M20-Ja25633	M20-Ja25634
Date Sampled			Jan 22, 2020	Jan 22, 2020	Jan 22, 2020	Jan 22, 2020
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	-	-	< 20
TRH C10-C14	20	mg/kg	< 20	-	-	< 20
TRH C15-C28	50	mg/kg	57	-	-	< 50
TRH C29-C36	50	mg/kg	62	-	-	< 50
TRH C10-C36 (Total)	50	mg/kg	119	-	-	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	-	-	< 0.1
Toluene	0.1	mg/kg	< 0.1	-	-	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	-	-	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	-	-	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	-	-	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	-	-	< 0.3
4-Bromofluorobenzene (surr.)	1	%	52	-	-	119
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	-	-	< 0.5
TRH C6-C10	20	mg/kg	< 20	-	-	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	-	-	< 20
TRH >C10-C16	50	mg/kg	< 50	-	-	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	-	-	< 50
TRH >C16-C34	100	mg/kg	< 100	-	-	< 100

Client Sample ID Sample Matrix Eurofins Sample No. Date Sampled Test/Reference	LOR	Unit	S32(0.0-0.2) Soil M20-Ja25628 Jan 22, 2020	S32(0.2-0.4) Soil M20-Ja25629 Jan 22, 2020	S33(0.2-0.4) Soil M20-Ja25633 Jan 22, 2020	S33(0.0-0.2) Soil M20-Ja25634 Jan 22, 2020
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
TRH >C34-C40	100	mg/kg	< 100	-	-	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	-	-	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	-	-	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	-	-	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	-	-	1.2
Acenaphthene	0.5	mg/kg	< 0.5	-	-	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	-	-	< 0.5
Anthracene	0.5	mg/kg	< 0.5	-	-	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	-	-	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	-	-	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	-	-	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	-	-	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	-	-	< 0.5
Chrysene	0.5	mg/kg	< 0.5	-	-	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	-	-	< 0.5
Fluoranthene	0.5	mg/kg	1.1	-	-	< 0.5
Fluorene	0.5	mg/kg	< 0.5	-	-	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	-	-	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	-	-	< 0.5
Phenanthrene	0.5	mg/kg	0.6	-	-	< 0.5
Pyrene	0.5	mg/kg	1.1	-	-	< 0.5
Total PAH*	0.5	mg/kg	2.8	-	-	< 0.5
2-Fluorobiphenyl (surr.)	1	%	93	-	-	90
p-Terphenyl-d14 (surr.)	1	%	101	-	-	80
Heavy Metals						
Arsenic	2	mg/kg	8.6	-	-	4.6
Cadmium	0.4	mg/kg	0.6	-	-	< 0.4
Chromium	5	mg/kg	13	-	-	21
Copper	5	mg/kg	63	-	-	< 5
Lead	5	mg/kg	220	-	-	19
Mercury	0.1	mg/kg	0.2	-	-	< 0.1
Nickel	5	mg/kg	10	-	-	5.2
Zinc	5	mg/kg	510	-	-	37
% Moisture	1	%	15	17	7.2	20
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5	< 5	< 5	[N09]6.4
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5	< 5	[N09]14	[N09]25
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5	< 5	< 5	[N09]9.0
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5	< 5	[N09]15	[N09]69
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	64	61	66	91

Client Sample ID			S32(0.0-0.2)	S32(0.2-0.4)	S33(0.2-0.4)	S33(0.0-0.2)
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M20-Ja25628	M20-Ja25629	M20-Ja25633	M20-Ja25634
Date Sampled			Jan 22, 2020	Jan 22, 2020	Jan 22, 2020	Jan 22, 2020
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
13C5-PFPeA (surr.)	1	%	67	65	69	95
13C5-PFHxA (surr.)	1	%	67	65	65	88
13C4-PFHpA (surr.)	1	%	63	59	64	95
13C8-PFOA (surr.)	1	%	70	68	67	81
13C5-PFNA (surr.)	1	%	82	78	85	93
13C6-PFDA (surr.)	1	%	90	87	68	51
13C2-PFUnDA (surr.)	1	%	101	87	111	93
13C2-PFDoDA (surr.)	1	%	102	97	89	91
13C2-PFTeDA (surr.)	1	%	82	87	91	89
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	64	63	62	70
D3-N-MeFOSA (surr.)	1	%	88	84	87	94
D5-N-EtFOSA (surr.)	1	%	105	98	95	103
D7-N-MeFOSE (surr.)	1	%	87	82	82	73
D9-N-EtFOSE (surr.)	1	%	71	71	60	112
D5-N-EtFOSAA (surr.)	1	%	84	85	81	83
D3-N-MeFOSAA (surr.)	1	%	80	80	75	93
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5	< 5	15	10.0
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	< 5	[N09]14	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5	< 5	5.0	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5	< 5	[N09]8.9	9.9
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	[N09]21	[N09]24	[N09]110	[N09]150
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	[N09]8.4	[N09]8.1	[N09]21	[N09]100
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]980	[N09]920	[N09]2400	[N09]2500
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	89	83	87	84
18O2-PFHxS (surr.)	1	%	82	80	68	82
13C8-PFOS (surr.)	1	%	100	102	100	95
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	37	35	49	75
13C2-6:2 FTSA (surr.)	1	%	37	35	55	84
13C2-8:2 FTSA (surr.)	1	%	71	71	71	128

Client Sample ID			S32(0.0-0.2)	S32(0.2-0.4)	S33(0.2-0.4)	S33(0.0-0.2)
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M20-Ja25628	M20-Ja25629	M20-Ja25633	M20-Ja25634
Date Sampled			Jan 22, 2020	Jan 22, 2020	Jan 22, 2020	Jan 22, 2020
Test/Reference	LOR	Unit				
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	1001	944	2510	2650
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	980	920	2415	2569
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	1001	944	2525	2719
Sum of WA DWER PFAS (n=10)*	10	ug/kg	1001	944	2554	2769.4
Sum of PFASs (n=30)*	50	ug/kg	1009.4	952.1	2602.9	2879.3

Client Sample ID			QC1
Sample Matrix			Soil
Eurofins Sample No.			M20-Ja25637
Date Sampled			Jan 22, 2020
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons - 1999 NEPM Fractions			
TRH C6-C9	20	mg/kg	< 20
TRH C10-C14	20	mg/kg	< 20
TRH C15-C28	50	mg/kg	< 50
TRH C29-C36	50	mg/kg	66
TRH C10-C36 (Total)	50	mg/kg	66
BTEX			
Benzene	0.1	mg/kg	< 0.1
Toluene	0.1	mg/kg	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2
o-Xylene	0.1	mg/kg	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3
4-Bromofluorobenzene (surr.)	1	%	51
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
Naphthalene[N02]	0.5	mg/kg	< 0.5
TRH C6-C10	20	mg/kg	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20
TRH >C10-C16	50	mg/kg	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50
TRH >C16-C34	100	mg/kg	< 100
TRH >C34-C40	100	mg/kg	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100
Polycyclic Aromatic Hydrocarbons			
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2
Acenaphthene	0.5	mg/kg	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5
Anthracene	0.5	mg/kg	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5
Chrysene	0.5	mg/kg	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5

Client Sample ID			QC1
Sample Matrix			Soil
Eurofins Sample No.			M20-Ja25637
Date Sampled			Jan 22, 2020
Test/Reference	LOR	Unit	
Polycyclic Aromatic Hydrocarbons			
Fluoranthene	0.5	mg/kg	0.8
Fluorene	0.5	mg/kg	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5
Naphthalene	0.5	mg/kg	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5
Pyrene	0.5	mg/kg	0.8
Total PAH*	0.5	mg/kg	1.6
2-Fluorobiphenyl (surr.)	1	%	107
p-Terphenyl-d14 (surr.)	1	%	111
Heavy Metals			
Arsenic	2	mg/kg	9.4
Cadmium	0.4	mg/kg	0.9
Chromium	5	mg/kg	16
Copper	5	mg/kg	68
Lead	5	mg/kg	270
Mercury	0.1	mg/kg	0.3
Nickel	5	mg/kg	11
Zinc	5	mg/kg	570
% Moisture	1	%	20
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5
13C4-PFBA (surr.)	1	%	51
13C5-PFPeA (surr.)	1	%	55
13C5-PFHxA (surr.)	1	%	52
13C4-PFHpA (surr.)	1	%	48
13C8-PFOA (surr.)	1	%	51
13C5-PFNA (surr.)	1	%	68
13C6-PFDA (surr.)	1	%	82
13C2-PFUnDA (surr.)	1	%	86
13C2-PFDoDA (surr.)	1	%	83
13C2-PFTeDA (surr.)	1	%	71
Perfluoroalkyl sulfonamido substances			
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	5	ug/kg	< 5

Client Sample ID			QC1
Sample Matrix			Soil
Eurofins Sample No.			M20-Ja25637
Date Sampled			Jan 22, 2020
Test/Reference	LOR	Unit	
Perfluoroalkyl sulfonamido substances			
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	5	ug/kg	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10
13C8-FOSA (surr.)	1	%	58
D3-N-MeFOSA (surr.)	1	%	79
D5-N-EtFOSA (surr.)	1	%	87
D7-N-MeFOSE (surr.)	1	%	73
D9-N-EtFOSE (surr.)	1	%	62
D5-N-EtFOSAA (surr.)	1	%	70
D3-N-MeFOSAA (surr.)	1	%	67
Perfluoroalkyl sulfonic acids (PFSAs)			
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	[N09]11
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	[N09]20
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	[N09]7.4
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]1200
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5
13C3-PFBS (surr.)	1	%	73
18O2-PFHxS (surr.)	1	%	71
13C8-PFOS (surr.)	1	%	74
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N15]	5	ug/kg	< 5
13C2-4:2 FTSA (surr.)	1	%	26
13C2-6:2 FTSA (surr.)	1	%	29
13C2-8:2 FTSA (surr.)	1	%	52
PFASs Summations			
Sum (PFHxS + PFOS)*	5	ug/kg	1220
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	1200
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	1220
Sum of WA DWER PFAS (n=10)*	10	ug/kg	1220
Sum of PFASs (n=30)*	50	ug/kg	1238.4

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

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

Description	Testing Site	Extracted	Holding Time
Eurofins | mgt Suite B7			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Melbourne	Feb 03, 2020	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Melbourne	Feb 03, 2020	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Feb 03, 2020	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Feb 03, 2020	
- Method: LTM-ORG-2010 TRH C6-C40			
Polycyclic Aromatic Hydrocarbons	Melbourne	Feb 03, 2020	14 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Metals M8	Melbourne	Feb 03, 2020	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
% Moisture	Melbourne	Jan 28, 2020	14 Days
- Method: LTM-GEN-7080 Moisture			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Jan 29, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Jan 29, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Jan 29, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Jan 29, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

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Company Name:	Nation Partners Pty Ltd	**Order No.:**		**Received:**	Jan 24, 2020 3:19 PM
Address:	306 / 50 Holt Street,	**Report #:**	698668	**Due:**	Feb 3, 2020
	Surry Hills	**Phone:**	0405 821 580	**Priority:**	5 Day
	NSW 2010	**Fax:**		**Contact Name:**	Luke Clements
Project Name:	NP19039				
Project ID:	FRNSW-TARRO				

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						HOLD	Moisture Set	Moisture Set	Eurofins | mgt Suite B7	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	
Sydney Laboratory - NATA Site # 18217										
Brisbane Laboratory - NATA Site # 20794							X	X		X
Perth Laboratory - NATA Site # 23736										
External Laboratory										
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**					
1	S28(0.0-0.2)	Jan 22, 2020		Soil	M20-Ja25610			X	X	X
2	S28(0.2-0.4)	Jan 22, 2020		Soil	M20-Ja25611		X			X
3	S28(0.4-0.6)	Jan 22, 2020		Soil	M20-Ja25612	X				
4	S28(0.6-0.8)	Jan 22, 2020		Soil	M20-Ja25613	X				
5	S28(0.8-1.0)	Jan 22, 2020		Soil	M20-Ja25614	X				
6	S29(0.0-0.2)	Jan 22, 2020		Soil	M20-Ja25615		X		X	X
7	S29(0.2-0.4)	Jan 22, 2020		Soil	M20-Ja25616			X		X
8	S29(0.4-0.6)	Jan 22, 2020		Soil	M20-Ja25617	X				
9	S29(0.6-0.8)	Jan 22, 2020		Soil	M20-Ja25618	X				
10	S29(0.8-1.0)	Jan 22, 2020		Soil	M20-Ja25619	X				

eurofins Environment Testing

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Company Name:	Nation Partners Pty Ltd	**Order No.:**		**Received:**	Jan 24, 2020 3:19 PM
Address:	306 / 50 Holt Street,	**Report #:**	698668	**Due:**	Feb 3, 2020
	Surry Hills	**Phone:**	0405 821 580	**Priority:**	5 Day
	NSW 2010	**Fax:**		**Contact Name:**	Luke Clements
Project Name:	NP19039				
Project ID:	FRNSW-TARRO				

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						HOLD	Moisture Set	Moisture Set	Eurofins | mgt Suite B7	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	
Sydney Laboratory - NATA Site # 18217										
Brisbane Laboratory - NATA Site # 20794							X	X		X
Perth Laboratory - NATA Site # 23736										
11	S30(0.0-0.2)	Jan 22, 2020		Soil	M20-Ja25620			X		X
12	S30(0.2-0.4)	Jan 22, 2020		Soil	M20-Ja25621			X		X
13	S30(0.4-0.6)	Jan 22, 2020		Soil	M20-Ja25622	X				
14	S30(0.6-0.8)	Jan 22, 2020		Soil	M20-Ja25623	X				
15	S31(0.0-0.2)	Jan 22, 2020		Soil	M20-Ja25624			X		X
16	S31(0.2-0.4)	Jan 22, 2020		Soil	M20-Ja25625			X		X
17	S31(0.4-0.6)	Jan 22, 2020		Soil	M20-Ja25626	X				
18	S31(0.6-0.8)	Jan 22, 2020		Soil	M20-Ja25627	X				
19	S32(0.0-0.2)	Jan 22, 2020		Soil	M20-Ja25628		X		X	X
20	S32(0.2-0.4)	Jan 22, 2020		Soil	M20-Ja25629			X		X
21	S32(0.4-0.6)	Jan 22, 2020		Soil	M20-Ja25630	X				
22	S32(0.6-0.8)	Jan 22, 2020		Soil	M20-Ja25631	X				
23	S32(0.8-1.0)	Jan 22, 2020		Soil	M20-Ja25632	X				

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IANZ # 1290

Company Name: Nation Partners Pty Ltd
Address: 306 / 50 Holt Street,
Surry Hills
NSW 2010

Project Name: NP19039
Project ID: FRNSW-TARRO

Order No.:
Report #: 698668
Phone: 0405 821 580
Fax:

Received: Jan 24, 2020 3:19 PM
Due: Feb 3, 2020
Priority: 5 Day
Contact Name: Luke Clements

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						HOLD	Moisture Set	Moisture Set	Eurofins | mgt Suite B7	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	
Sydney Laboratory - NATA Site # 18217										
Brisbane Laboratory - NATA Site # 20794							X	X		X
Perth Laboratory - NATA Site # 23736										
24	S33(0.2-0.4)	Jan 22, 2020		Soil	M20-Ja25633		X			X
25	S33(0.0-0.2)	Jan 22, 2020		Soil	M20-Ja25634		X		X	X
26	S33A(0.4-0.6)	Jan 22, 2020		Soil	M20-Ja25635	X				
27	S33A(0.6-0.8)	Jan 22, 2020		Soil	M20-Ja25636	X				
28	QC1	Jan 22, 2020		Soil	M20-Ja25637		X		X	X
29	QC2	Jan 22, 2020		Soil	M20-Ja25638	X				
30	TRIP BLANK	Jan 22, 2020		Soil	M20-Ja25639	X				
31	TRIP SPIKE	Jan 22, 2020		Soil	M20-Ja25640	X				
Test Counts						18	13	13	5	13

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

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

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Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/kg	< 5			5	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/kg	< 5			5	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	93			70-130	Pass	
TRH C10-C14	%	125			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	98			70-130	Pass	
Toluene	%	101			70-130	Pass	
Ethylbenzene	%	94			70-130	Pass	
m&p-Xylenes	%	96			70-130	Pass	
Xylenes - Total	%	96			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	96			70-130	Pass	
TRH C6-C10	%	76			70-130	Pass	
TRH >C10-C16	%	113			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	127			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Acenaphthylene	%	128			70-130	Pass	
Anthracene	%	120			70-130	Pass	
Benz(a)anthracene	%	122			70-130	Pass	
Benzo(a)pyrene	%	118			70-130	Pass	
Benzo(b&j)fluoranthene	%	121			70-130	Pass	
Benzo(g.h.i)perylene	%	115			70-130	Pass	
Benzo(k)fluoranthene	%	107			70-130	Pass	
Chrysene	%	129			70-130	Pass	
Dibenz(a.h)anthracene	%	99			70-130	Pass	
Fluoranthene	%	126			70-130	Pass	
Fluorene	%	126			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	107			70-130	Pass	
Naphthalene	%	119			70-130	Pass	
Phenanthrene	%	108			70-130	Pass	
Pyrene	%	125			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	111			80-120	Pass	
Cadmium	%	101			80-120	Pass	
Chromium	%	112			80-120	Pass	
Copper	%	114			80-120	Pass	
Lead	%	112			80-120	Pass	
Mercury	%	111			75-125	Pass	
Nickel	%	110			80-120	Pass	
Zinc	%	111			80-120	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	106			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	102			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	106			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	99			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	106			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	99			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	91			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	88			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	105			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	140			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	104			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	108			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	102			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	99			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	101			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	74			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	107			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	98			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	124			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	100			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	102			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	90			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	94			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluoroheptanesulfonic acid (PFHpS)			%	138			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)			%	106			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)			%	88			50-150	Pass	
LCS - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)									
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)			%	107			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)			%	93			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)			%	96			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)			%	102			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S20-Ja19956	NCP	%	82			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S20-Ja19956	NCP	%	89			70-130	Pass	
Toluene	S20-Ja19956	NCP	%	98			70-130	Pass	
Ethylbenzene	S20-Ja19956	NCP	%	94			70-130	Pass	
m&p-Xylenes	S20-Ja19956	NCP	%	95			70-130	Pass	
o-Xylene	S20-Ja19956	NCP	%	98			70-130	Pass	
Xylenes - Total	S20-Ja19956	NCP	%	96			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S20-Ja19956	NCP	%	106			70-130	Pass	
TRH C6-C10	S20-Ja19956	NCP	%	90			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	M20-Ja27482	NCP	%	123			70-130	Pass	
Acenaphthylene	M20-Ja27482	NCP	%	121			70-130	Pass	
Anthracene	M20-Ja27482	NCP	%	113			70-130	Pass	
Benz(a)anthracene	M20-Ja27482	NCP	%	123			70-130	Pass	
Benzo(a)pyrene	M20-Ja27482	NCP	%	114			70-130	Pass	
Benzo(b&j)fluoranthene	M20-Ja27482	NCP	%	123			70-130	Pass	
Benzo(g.h.i)perylene	M20-Ja27482	NCP	%	112			70-130	Pass	
Benzo(k)fluoranthene	M20-Ja27482	NCP	%	105			70-130	Pass	
Chrysene	M20-Ja27482	NCP	%	105			70-130	Pass	
Dibenz(a.h)anthracene	M20-Ja27482	NCP	%	94			70-130	Pass	
Fluoranthene	M20-Ja27482	NCP	%	129			70-130	Pass	
Fluorene	M20-Ja27482	NCP	%	119			70-130	Pass	
Indeno(1.2.3-cd)pyrene	M20-Ja27482	NCP	%	127			70-130	Pass	
Naphthalene	M20-Ja27482	NCP	%	118			70-130	Pass	
Phenanthrene	M20-Ja27482	NCP	%	128			70-130	Pass	
Pyrene	M20-Ja27482	NCP	%	105			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	M20-Ja25729	NCP	%	83			75-125	Pass	
Cadmium	M20-Ja25729	NCP	%	91			75-125	Pass	
Chromium	M20-Ja25729	NCP	%	79			75-125	Pass	
Copper	M20-Ja25729	NCP	%	78			75-125	Pass	
Lead	M20-Ja25729	NCP	%	546			75-125	Fail	Q08
Mercury	M20-Ja25729	NCP	%	176			70-130	Fail	Q08
Nickel	M20-Ja25729	NCP	%	80			75-125	Pass	
Zinc	M20-Ja25729	NCP	%	308			75-125	Fail	Q08
Spike - % Recovery									

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Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	M20-Ja25372	NCP	%	108			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M20-Ja25372	NCP	%	104			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M20-Ja25372	NCP	%	107			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M20-Ja25372	NCP	%	99			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M20-Ja25372	NCP	%	105			50-150	Pass	
Perfluorononanoic acid (PFNA)	M20-Ja25372	NCP	%	107			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M20-Ja25372	NCP	%	95			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M20-Ja25372	NCP	%	99			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M20-Ja25372	NCP	%	123			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M20-Ja25372	NCP	%	137			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M20-Ja25372	NCP	%	106			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	M20-Ja25372	NCP	%	114			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M20-Ja25372	NCP	%	105			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M20-Ja25372	NCP	%	101			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M20-Ja25372	NCP	%	114			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M20-Ja25372	NCP	%	81			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M20-Ja25372	NCP	%	107			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M20-Ja25372	NCP	%	109			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M20-Ja25372	NCP	%	143			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	M20-Ja25372	NCP	%	118			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M20-Ja25372	NCP	%	106			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M20-Ja25372	NCP	%	97			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M20-Ja25372	NCP	%	82			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M20-Ja25372	NCP	%	128			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M20-Ja25372	NCP	%	114			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M20-Ja25372	NCP	%	100			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M20-Ja25372	NCP	%	107			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	M20-Ja25372	NCP	%	104			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M20-Ja25372	NCP	%	109			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M20-Ja25372	NCP	%	104			50-150	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C10-C14	M20-Ja25637	CP	%	80			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	M20-Ja25637	CP	%	72			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S20-Ja19955	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S20-Ja19955	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S20-Ja19955	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S20-Ja19955	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S20-Ja19955	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	S20-Ja19955	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total	S20-Ja19955	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S20-Ja19955	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S20-Ja19955	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	M20-Ja24881	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	M20-Ja24881	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	M20-Ja24881	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	M20-Ja24881	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	M20-Ja24881	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	M20-Ja24881	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g.h.i)perylene	M20-Ja24881	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	M20-Ja24881	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	M20-Ja24881	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	M20-Ja24881	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	M20-Ja24881	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	M20-Ja24881	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	M20-Ja24881	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	M20-Ja24881	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	M20-Ja24881	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	M20-Ja24881	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	M20-Ja24827	NCP	mg/kg	< 2	< 2	<1	30%	Pass	
Cadmium	M20-Ja24827	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	M20-Ja24827	NCP	mg/kg	34	35	1.0	30%	Pass	
Copper	M20-Ja24827	NCP	mg/kg	12	12	1.0	30%	Pass	
Lead	M20-Ja24827	NCP	mg/kg	11	11	1.0	30%	Pass	
Mercury	M20-Ja24827	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	M20-Ja24827	NCP	mg/kg	47	48	1.0	30%	Pass	
Zinc	M20-Ja24827	NCP	mg/kg	30	30	<1	30%	Pass	

Duplicate									
				Result 1	Result 2	RPD			
% Moisture	M20-Ja25615	CP	%	18	18	2.0	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C10-C14	M20-Ja25637	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	M20-Ja25637	CP	mg/kg	< 50	55	13	30%	Pass	
TRH C29-C36	M20-Ja25637	CP	mg/kg	66	71	7.0	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	M20-Ja25637	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	M20-Ja25637	CP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	M20-Ja25637	CP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	M20-Ja25637	CP	%	20	20	<1	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M20-Ja25637	CP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M20-Ja25637	CP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	M20-Ja25637	CP	ug/kg	11	9.1	18	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorohexanesulfonic acid (PFHxS)	M20-Ja25637	CP	ug/kg	20	19	4.0	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M20-Ja25637	CP	ug/kg	7.4	7.2	2.0	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	M20-Ja25637	CP	ug/kg	1200	1100	10	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	M20-Ja25637	CP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M20-Ja25637	CP	ug/kg	< 5	< 5	<1	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).
Q08	The matrix spike recovery is outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference.

Authorised By

Ursula Long	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Harry Bacalis	Senior Analyst-Volatile (VIC)
Joseph Edouard	Senior Analyst-Organic (VIC)
Sarah McCallion	Senior Analyst-PFAS (QLD)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please click here.

Environment Testing

NATA Accredited
Accreditation Number 1261
Site Number 20794

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

Nation Partners
306 / 50 Holt Street,
Surry Hills
NSW 2010

Attention: **Luke Clements**

Report **700221-L**
Project name NP19039
Project ID FRNSW-TARRO
Received Date Feb 04, 2020

Client Sample ID			**S29(0.0-0.2)**	**S33(0.2-0.4)**	**S32(0.0-0.2)**
Sample Matrix			**US Leachate**	**US Leachate**	**US Leachate**
Eurofins Sample No.			**B20-Fe04453**	**B20-Fe04454**	**B20-Fe04455**
Date Sampled			**Jan 22, 2020**	**Jan 22, 2020**	**Jan 22, 2020**
Test/Reference	LOR	Unit			
Polycyclic Aromatic Hydrocarbons					
Acenaphthene	0.001	mg/L	-	-	< 0.001
Acenaphthylene	0.001	mg/L	-	-	< 0.001
Anthracene	0.001	mg/L	-	-	< 0.001
Benz(a)anthracene	0.001	mg/L	-	-	< 0.001
Benzo(a)pyrene	0.001	mg/L	-	-	< 0.001
Benzo(b&j)fluoranthene[N07]	0.001	mg/L	-	-	< 0.001
Benzo(g.h.i)perylene	0.001	mg/L	-	-	< 0.001
Benzo(k)fluoranthene	0.001	mg/L	-	-	< 0.001
Chrysene	0.001	mg/L	-	-	< 0.001
Dibenz(a.h)anthracene	0.001	mg/L	-	-	< 0.001
Fluoranthene	0.001	mg/L	-	-	< 0.001
Fluorene	0.001	mg/L	-	-	< 0.001
Indeno(1.2.3-cd)pyrene	0.001	mg/L	-	-	< 0.001
Naphthalene	0.001	mg/L	-	-	< 0.001
Phenanthrene	0.001	mg/L	-	-	< 0.001
Pyrene	0.001	mg/L	-	-	< 0.001
Total PAH*	0.001	mg/L	-	-	< 0.001
2-Fluorobiphenyl (surr.)	1	%	-	-	60
p-Terphenyl-d14 (surr.)	1	%	-	-	94
Heavy Metals					
Lead	0.01	mg/L	-	-	0.69
USA Leaching Procedure					
Leachate Fluid[C01]		comment	1.0	1.0	1.0
pH (initial)	0.1	pH Units	5.0	5.0	6.8
pH (Leachate fluid)	0.1	pH Units	5.0	5.0	4.9
pH (off)	0.1	pH Units	5.0	5.0	5.1
pH (USA HCl addition)	0.1	pH Units	1.0	0.9	1.7
Perfluoroalkyl carboxylic acids (PFCAs)					
Perfluorobutanoic acid (PFBA)[N11]	0.05	ug/L	0.17	0.12	-
Perfluoropentanoic acid (PFPeA)[N11]	0.01	ug/L	0.33	0.18	-
Perfluorohexanoic acid (PFHxA)[N11]	0.01	ug/L	0.58	0.49	-
Perfluoroheptanoic acid (PFHpA)[N11]	0.01	ug/L	0.14	0.09	-
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	0.33	0.47	-
Perfluorononanoic acid (PFNA)[N11]	0.01	ug/L	0.08	< 0.01	-
Perfluorodecanoic acid (PFDA)[N11]	0.01	ug/L	< 0.01	< 0.01	-

Client Sample ID			S29(0.0-0.2)	S33(0.2-0.4)	S32(0.0-0.2)
Sample Matrix			US Leachate	US Leachate	US Leachate
Eurofins Sample No.			B20-Fe04453	B20-Fe04454	B20-Fe04455
Date Sampled			Jan 22, 2020	Jan 22, 2020	Jan 22, 2020
Test/Reference	LOR	Unit			
Perfluoroalkyl carboxylic acids (PFCAs)					
Perfluoroundecanoic acid (PFUnDA)[N11]	0.01	ug/L	< 0.01	< 0.01	-
Perfluorododecanoic acid (PFDoDA)[N11]	0.01	ug/L	< 0.01	< 0.01	-
Perfluorotridecanoic acid (PFTrDA)[N15]	0.01	ug/L	< 0.01	< 0.01	-
Perfluorotetradecanoic acid (PFTeDA)[N11]	0.01	ug/L	< 0.01	< 0.01	-
13C4-PFBA (surr.)	1	%	35	47	-
13C5-PFPeA (surr.)	1	%	40	39	-
13C5-PFHxA (surr.)	1	%	58	51	-
13C4-PFHpA (surr.)	1	%	70	55	-
13C8-PFOA (surr.)	1	%	92	64	-
13C5-PFNA (surr.)	1	%	104	76	-
13C6-PFDA (surr.)	1	%	82	70	-
13C2-PFUnDA (surr.)	1	%	47	68	-
13C2-PFDoDA (surr.)	1	%	22	41	-
13C2-PFTeDA (surr.)	1	%	32	25	-
Perfluoroalkyl sulfonamido substances					
Perfluorooctane sulfonamide (FOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	-
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	-
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	-
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05	-
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05	-
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05	-
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05	-
13C8-FOSA (surr.)	1	%	83	106	-
D3-N-MeFOSA (surr.)	1	%	47	59	-
D5-N-EtFOSA (surr.)	1	%	43	49	-
D7-N-MeFOSE (surr.)	1	%	102	143	-
D9-N-EtFOSE (surr.)	1	%	78	102	-
D5-N-EtFOSAA (surr.)	1	%	54	86	-
D3-N-MeFOSAA (surr.)	1	%	67	82	-
Perfluoroalkyl sulfonic acids (PFSAs)					
Perfluorobutanesulfonic acid (PFBS)[N11]	0.01	ug/L	0.22	0.33	-
Perfluorononanesulfonic acid (PFNS)[N15]	0.01	ug/L	0.02	0.02	-
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.01	ug/L	0.07	0.13	-
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.01	ug/L	0.18	0.24	-
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	1.5	2.8	-
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	0.14	0.34	-
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	20	39	-
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01	0.01	-
13C3-PFBS (surr.)	1	%	109	118	-
18O2-PFHxS (surr.)	1	%	120	121	-
13C8-PFOS (surr.)	1	%	105	126	-

Client Sample ID			S29(0.0-0.2)	S33(0.2-0.4)	S32(0.0-0.2)
Sample Matrix			US Leachate	US Leachate	US Leachate
Eurofins Sample No.			B20-Fe04453	B20-Fe04454	B20-Fe04455
Date Sampled			Jan 22, 2020	Jan 22, 2020	Jan 22, 2020
Test/Reference	LOR	Unit			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)N11	0.01	ug/L	< 0.01	< 0.01	-
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)N11	0.05	ug/L	< 0.05	< 0.05	-
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)N11	0.01	ug/L	< 0.01	< 0.01	-
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)N15	0.01	ug/L	< 0.01	< 0.01	-
13C2-4:2 FTSA (surr.)	1	%	29	24	-
13C2-6:2 FTSA (surr.)	1	%	91	52	-
13C2-8:2 FTSA (surr.)	1	%	80	61	-
PFASs Summations					
Sum (PFHxS + PFOS)*	0.01	ug/L	21.5	41.8	-
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	20.33	39.47	-
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	21.83	42.27	-
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	23.27	43.48	-
Sum of PFASs (n=30)*	0.1	ug/L	23.76	44.22	-

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

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

Description	Testing Site	Extracted	Holding Time
Polycyclic Aromatic Hydrocarbons	Melbourne	Feb 06, 2020	7 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Heavy Metals	Melbourne	Feb 05, 2020	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
USA Leaching Procedure	Melbourne	Feb 05, 2020	14 Days
- Method: LTM-GEN-7010 Leaching Procedure for Soils & Solid Wastes			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Feb 06, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Feb 06, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Feb 06, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Feb 06, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

Australia

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IANZ # 1290

Company Name: Nation Partners Pty Ltd
Address: 306 / 50 Holt Street,
Surry Hills
NSW 2010

Project Name: NP19039
Project ID: FRNSW-TARRO

Order No.:
Report #: 700221
Phone: 0405 821 580
Fax:

Received: Feb 4, 2020 10:28 AM
Due: Feb 10, 2020
Priority: 5 Day
Contact Name: Luke Clements

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						Lead	Polycyclic Aromatic Hydrocarbons	USA Leaching Procedure	USA Leaching Procedure	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X			
Sydney Laboratory - NATA Site # 18217											
Brisbane Laboratory - NATA Site # 20794									X	X	X
Perth Laboratory - NATA Site # 23736											
External Laboratory											
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**						
1	S29(0.4-0.6)	Jan 22, 2020		Soil	B20-Fe04450					X	X
2	S30(0.4-0.6)	Jan 22, 2020		Soil	B20-Fe04451					X	X
3	S33A(0.6-0.8)	Jan 22, 2020		Soil	B20-Fe04452					X	X
4	S29(0.0-0.2)	Jan 22, 2020		US Leachate	B20-Fe04453				X		X
5	S33(0.2-0.4)	Jan 22, 2020		US Leachate	B20-Fe04454				X		X
6	S32(0.0-0.2)	Jan 22, 2020		US Leachate	B20-Fe04455	X	X	X			
Test Counts						1	1	3	3	3	5

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

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

Quality Control Results

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank									
Heavy Metals									
Lead			mg/L	< 0.01			0.01	Pass	
Method Blank									
Perfluoroalkyl carboxylic acids (PFCAs)									
Perfluorobutanoic acid (PFBA)			ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)			ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)			ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)			ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)			ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)			ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)			ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)			ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)			ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTrDA)			ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)			ug/L	< 0.01			0.01	Pass	
Method Blank									
Perfluoroalkyl sulfonamido substances									
Perfluorooctane sulfonamide (FOSA)			ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)			ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)			ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)			ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)			ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)			ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)			ug/L	< 0.05			0.05	Pass	
Method Blank									
Perfluoroalkyl sulfonic acids (PFSAs)									
Perfluorobutanesulfonic acid (PFBS)			ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)			ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)			ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)			ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)			ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)			ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)			ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)			ug/L	< 0.01			0.01	Pass	
Method Blank									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)									
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)			ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)			ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)			ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)			ug/L	< 0.01			0.01	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Heavy Metals				Result 1					
Lead	M20-Fe05452	NCP	%	101			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	B20-Fe04481	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	B20-Fe04481	NCP	ug/L	0.02	0.02	4.0	30%	Pass	
Perfluorohexanoic acid (PFHxA)	B20-Fe04481	NCP	ug/L	0.09	0.08	7.0	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	B20-Fe04481	NCP	ug/L	0.02	0.02	5.0	30%	Pass	
Perfluorooctanoic acid (PFOA)	B20-Fe04481	NCP	ug/L	0.04	0.04	5.0	30%	Pass	
Perfluorononanoic acid (PFNA)	B20-Fe04481	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	B20-Fe04481	NCP	ug/L	0.01	0.01	2.0	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	B20-Fe04481	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	B20-Fe04481	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	B20-Fe04481	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	B20-Fe04481	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	B20-Fe04481	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	B20-Fe04481	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B20-Fe04481	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	B20-Fe04481	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	B20-Fe04481	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B20-Fe04481	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	B20-Fe04481	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	B20-Fe04481	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	B20-Fe04481	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	B20-Fe04481	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	B20-Fe04481	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	B20-Fe04481	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	B20-Fe04481	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	B20-Fe04481	NCP	ug/L	0.01	0.01	2.0	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	B20-Fe04481	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	B20-Fe04481	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	B20-Fe04481	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	B20-Fe04481	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	B20-Fe04481	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Lead	M20-Fe05452	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
C01	Leachate Fluid Key: 1 - pH 5.0; 2 - pH 2.9; 3 - pH 9.2; 4 - Reagent (DI) water; 5 - Client sample, 6 - other
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

Ursula Long	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Joseph Edouard	Senior Analyst-Organic (VIC)
Sarah McCallion	Senior Analyst-PFAS (QLD)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please click here.

eurofins Environment Testing

NATA Accredited
Accreditation Number 1261
Site Number 20794

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

Nation Partners
306 / 50 Holt Street,
Surry Hills
NSW 2010

Attention: **Luke Clements**

Report **700221-S**
Project name NP19039
Project ID FRNSW-TARRO
Received Date Feb 04, 2020

Client Sample ID			**S29(0.4-0.6)**	**S30(0.4-0.6)**	**S33A(0.6-0.8)**
Sample Matrix			**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**B20-Fe04450**	**B20-Fe04451**	**B20-Fe04452**
Date Sampled			**Jan 22, 2020**	**Jan 22, 2020**	**Jan 22, 2020**
Test/Reference	LOR	Unit			
% Moisture	1	%	19	26	23
Perfluoroalkyl carboxylic acids (PFCAs)					
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	14	7.8	7.8
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	56	12	59
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	[N09]18	7.2	[N09]16
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	[N09]110	[N09]27	[N09]47
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	35	< 5	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	109	130	118
13C5-PFPeA (surr.)	1	%	87	104	96
13C5-PFHxA (surr.)	1	%	86	122	96
13C4-PFHpA (surr.)	1	%	105	130	120
13C8-PFOA (surr.)	1	%	80	108	94
13C5-PFNA (surr.)	1	%	92	116	118
13C6-PFDA (surr.)	1	%	67	110	94
13C2-PFUnDA (surr.)	1	%	134	141	155
13C2-PFDoDA (surr.)	1	%	126	144	156
13C2-PFTeDA (surr.)	1	%	68	73	86
Perfluoroalkyl sulfonamido substances					
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	5	ug/kg	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	5	ug/kg	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	79	84	95

Client Sample ID			S29(0.4-0.6)	S30(0.4-0.6)	S33A(0.6-0.8)
Sample Matrix			Soil	Soil	Soil
Eurofins Sample No.			B20-Fe04450	B20-Fe04451	B20-Fe04452
Date Sampled			Jan 22, 2020	Jan 22, 2020	Jan 22, 2020
Test/Reference	LOR	Unit			
Perfluoroalkyl sulfonamido substances					
D3-N-MeFOSA (surr.)	1	%	84	97	107
D5-N-EtFOSA (surr.)	1	%	88	93	116
D7-N-MeFOSE (surr.)	1	%	78	90	92
D9-N-EtFOSE (surr.)	1	%	56	72	71
D5-N-EtFOSAA (surr.)	1	%	69	71	77
D3-N-MeFOSAA (surr.)	1	%	68	83	86
Perfluoroalkyl sulfonic acids (PFSAs)					
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	22	< 5	49
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	6.1	< 5	20
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	[N09]26	< 5	[N09]54
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	[N09]220	[N09]53	[N09]450
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	[N09]62	[N09]15	[N09]55
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]990	[N09]490	[N09]690
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	96	129	102
18O2-PFHxS (surr.)	1	%	75	102	103
13C8-PFOS (surr.)	1	%	109	103	101
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N15]	5	ug/kg	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	73	119	105
13C2-6:2 FTSA (surr.)	1	%	84	122	101
13C2-8:2 FTSA (surr.)	1	%	94	125	122
PFASs Summations					
Sum (PFHxS + PFOS)*	5	ug/kg	1210	543	1140
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	1100	517	737
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	1320	570	1187
Sum of WA DWER PFAS (n=10)*	10	ug/kg	1430	597	1318.8
Sum of PFASs (n=30)*	50	ug/kg	1559.1	612	1447.8

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

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

Description	Testing Site	Extracted	Holding Time
% Moisture	Brisbane	Feb 05, 2020	14 Days
- Method: LTM-GEN-7080 Moisture			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Feb 05, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Feb 05, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Feb 05, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Feb 05, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

eurofins Environment Testing

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Address: 306 / 50 Holt Street,
Surry Hills
NSW 2010

Project Name: NP19039
Project ID: FRNSW-TARRO

Order No.:
Report #: 700221
Phone: 0405 821 580
Fax:

Received: Feb 4, 2020 10:28 AM
Due: Feb 10, 2020
Priority: 5 Day
Contact Name: Luke Clements

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						Lead	Polycyclic Aromatic Hydrocarbons	USA Leaching Procedure	USA Leaching Procedure	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X			
Sydney Laboratory - NATA Site # 18217											
Brisbane Laboratory - NATA Site # 20794									X	X	X
Perth Laboratory - NATA Site # 23736											
External Laboratory											
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**						
1	S29(0.4-0.6)	Jan 22, 2020		Soil	B20-Fe04450					X	X
2	S30(0.4-0.6)	Jan 22, 2020		Soil	B20-Fe04451					X	X
3	S33A(0.6-0.8)	Jan 22, 2020		Soil	B20-Fe04452					X	X
4	S29(0.0-0.2)	Jan 22, 2020		US Leachate	B20-Fe04453				X		X
5	S33(0.2-0.4)	Jan 22, 2020		US Leachate	B20-Fe04454				X		X
6	S32(0.0-0.2)	Jan 22, 2020		US Leachate	B20-Fe04455	X	X	X			
Test Counts						1	1	3	3	3	5

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

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

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Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/kg	< 5			5	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/kg	< 5			5	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/kg	< 5			5	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	106			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	148			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	128			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	104			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	119			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	116			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	81			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	93			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	141			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	142			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	124			50-150	Pass	

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Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	135			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	104			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	129			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	115			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	77			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	98			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	95			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	85			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	87			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	108			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	87			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	90			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	104			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	104			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	95			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	125			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	101			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	108			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	86			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	M20-Fe02104	NCP	%	110			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M20-Fe02104	NCP	%	146			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M20-Fe02104	NCP	%	134			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M20-Fe02104	NCP	%	105			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M20-Fe02104	NCP	%	127			50-150	Pass	
Perfluorononanoic acid (PFNA)	M20-Fe02104	NCP	%	112			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M20-Fe02104	NCP	%	81			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M20-Fe02104	NCP	%	100			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M20-Fe02104	NCP	%	139			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M20-Fe02104	NCP	%	142			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M20-Fe02104	NCP	%	123			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	M20-Fe02104	NCP	%	127			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M20-Fe02104	NCP	%	100			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M20-Fe02104	NCP	%	125			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M20-Fe02104	NCP	%	105			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M20-Fe02104	NCP	%	75			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M20-Fe02104	NCP	%	103			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M20-Fe02104	NCP	%	100			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M20-Fe02104	NCP	%	90			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	M20-Fe02104	NCP	%	98			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M20-Fe02104	NCP	%	112			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M20-Fe02104	NCP	%	90			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M20-Fe02104	NCP	%	103			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M20-Fe02104	NCP	%	95			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	B20-Fe02578	NCP	%	101			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M20-Fe02104	NCP	%	103			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M20-Fe02104	NCP	%	129			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	M20-Fe02104	NCP	%	104			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M20-Fe02104	NCP	%	119			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M20-Fe02104	NCP	%	113			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	N20-Fe02874	NCP	%	7.0	7.2	3.0	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	S20-Fe01758	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	S20-Fe01758	NCP	ug/kg	7.4	7.3	2.0	30%	Pass	
Perfluorohexanoic acid (PFHxA)	S20-Fe01758	NCP	ug/kg	11	12	14	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	S20-Fe01758	NCP	ug/kg	7.3	7.8	7.0	30%	Pass	
Perfluorooctanoic acid (PFOA)	S20-Fe01758	NCP	ug/kg	42	47	10	30%	Pass	
Perfluorononanoic acid (PFNA)	S20-Fe01758	NCP	ug/kg	< 5	5.2	10	30%	Pass	
Perfluorodecanoic acid (PFDA)	S20-Fe01758	NCP	ug/kg	11	13	16	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	S20-Fe01758	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	S20-Fe01758	NCP	ug/kg	< 5	5.1	14	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	S20-Fe01758	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	S20-Fe01758	NCP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	S20-Fe01758	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S20-Fe01758	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S20-Fe01758	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S20-Fe01758	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S20-Fe01758	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S20-Fe01758	NCP	ug/kg	13	14	8.0	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S20-Fe01758	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	S20-Fe01758	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	S20-Fe01758	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	S20-Fe01758	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	M20-Fe04181	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	S20-Fe01758	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S20-Fe01758	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S20-Fe01758	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S20-Fe01758	NCP	ug/kg	< 5	< 5	<1	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

Ursula Long	Analytical Services Manager
Sarah McCallion	Senior Analyst-PFAS (QLD)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please click here.

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Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 20794

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

Nation Partners
306 / 50 Holt Street,
Surry Hills
NSW 2010

Attention: **Luke Clements**

Report	**701333-S**
Project name	NP19039
Project ID	FRNSW-TARRO
Received Date	Feb 11, 2020

Client Sample ID			**S29(0.6-0.8)**	**S29(0.8-1.0)**	**S30(0.6-0.8)**
Sample Matrix			**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**B20-Fe13018**	**B20-Fe13019**	**B20-Fe13020**
Date Sampled			**Jan 22, 2020**	**Jan 22, 2020**	**Jan 22, 2020**
Test/Reference	LOR	Unit			
% Moisture	1	%	15	28	28
Perfluoroalkyl carboxylic acids (PFCAs)					
Perfluorobutanoic acid (PFBA)N11	5	ug/kg	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA)N11	5	ug/kg	16	11	5.1
Perfluorohexanoic acid (PFHxA)N11	5	ug/kg	77	50	9.6
Perfluoroheptanoic acid (PFHpA)N11	5	ug/kg	34	17	5.9
Perfluorooctanoic acid (PFOA)N11	5	ug/kg	N09 43	N09 23	N09 9.7
Perfluorononanoic acid (PFNA)N11	5	ug/kg	5.3	< 5	< 5
Perfluorodecanoic acid (PFDA)N11	5	ug/kg	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)N11	5	ug/kg	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)N11	5	ug/kg	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)N15	5	ug/kg	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)N11	5	ug/kg	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	112	114	128
13C5-PFPeA (surr.)	1	%	125	137	148
13C5-PFHxA (surr.)	1	%	110	118	145
13C4-PFHpA (surr.)	1	%	119	111	139
13C8-PFOA (surr.)	1	%	110	108	126
13C5-PFNA (surr.)	1	%	133	122	135
13C6-PFDA (surr.)	1	%	99	109	121
13C2-PFUnDA (surr.)	1	%	137	135	132
13C2-PFDoDA (surr.)	1	%	129	134	128
13C2-PFTeDA (surr.)	1	%	141	139	160
Perfluoroalkyl sulfonamido substances					
Perfluorooctane sulfonamide (FOSA)N11	5	ug/kg	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)N11	5	ug/kg	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)N11	5	ug/kg	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)N11	5	ug/kg	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)N11	5	ug/kg	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)N11	10	ug/kg	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)N11	10	ug/kg	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	124	127	123

Client Sample ID			S29(0.6-0.8)	S29(0.8-1.0)	S30(0.6-0.8)
Sample Matrix			Soil	Soil	Soil
Eurofins Sample No.			B20-Fe13018	B20-Fe13019	B20-Fe13020
Date Sampled			Jan 22, 2020	Jan 22, 2020	Jan 22, 2020
Test/Reference	LOR	Unit			
Perfluoroalkyl sulfonamido substances					
D3-N-MeFOSA (surr.)	1	%	99	106	108
D5-N-EtFOSA (surr.)	1	%	118	140	136
D7-N-MeFOSE (surr.)	1	%	120	120	124
D9-N-EtFOSE (surr.)	1	%	62	106	100
D5-N-EtFOSAA (surr.)	1	%	94	96	101
D3-N-MeFOSAA (surr.)	1	%	89	92	91
Perfluoroalkyl sulfonic acids (PFSAs)					
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	59	48	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	11	9.9	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	59	39	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	[N09]380	[N09]170	[N09]55
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	[N09]18	[N09]11	5.8
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]640	[N09]220	[N09]380
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	117	116	138
18O2-PFHxS (surr.)	1	%	86	108	121
13C8-PFOS (surr.)	1	%	114	121	107
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N15]	5	ug/kg	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	131	108	125
13C2-6:2 FTSA (surr.)	1	%	101	83	143
13C2-8:2 FTSA (surr.)	1	%	110	119	135
PFASs Summations					
Sum (PFHxS + PFOS)*	5	ug/kg	1020	390	435
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	683	243	389.7
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	1063	413	444.7
Sum of WA DWER PFAS (n=10)*	10	ug/kg	1249	539	465.3
Sum of PFASs (n=30)*	50	ug/kg	1342.3	598.9	471.1

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

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

Description	Testing Site	Extracted	Holding Time
% Moisture	Brisbane	Feb 11, 2020	14 Days
- Method: LTM-GEN-7080 Moisture			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Feb 12, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Feb 12, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Feb 12, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Feb 12, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

Company Name: Nation Partners Pty Ltd
Address: 306 / 50 Holt Street,
Surry Hills
NSW 2010

Project Name: NP19039
Project ID: FRNSW-TARRO

Order No.:
Report #: 701333
Phone: 0405 821 580
Fax:

Received: Feb 11, 2020 8:50 AM
Due: Feb 14, 2020
Priority: 3 Day
Contact Name: Luke Clements

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794						X	X
Perth Laboratory - NATA Site # 23736							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	S29(0.6-0.8)	Jan 22, 2020		Soil	B20-Fe13018	X	X
2	S29(0.8-1.0)	Jan 22, 2020		Soil	B20-Fe13019	X	X
3	S30(0.6-0.8)	Jan 22, 2020		Soil	B20-Fe13020	X	X
Test Counts						3	3

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

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

Environment Testing

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/kg	< 5			5	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/kg	< 5			5	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/kg	< 5			5	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	95			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	92			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	85			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	96			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	90			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	109			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	98			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	116			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	114			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	116			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	98			50-150	Pass	

eurofins | Environment Testing

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	87			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	101			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	85			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	92			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	85			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	99			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	104			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	86			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	80			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	98			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	78			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	89			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	94			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	84			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	79			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	96			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	71			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	92			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	92			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	M20-Fe13143	NCP	%	82			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M20-Fe13143	NCP	%	96			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M20-Fe13143	NCP	%	82			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M20-Fe13143	NCP	%	90			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M20-Fe13143	NCP	%	90			50-150	Pass	
Perfluorononanoic acid (PFNA)	M20-Fe13143	NCP	%	93			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M20-Fe13143	NCP	%	89			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M20-Fe13143	NCP	%	113			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M20-Fe13143	NCP	%	116			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M20-Fe13143	NCP	%	106			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M20-Fe13143	NCP	%	96			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	M20-Fe13143	NCP	%	87			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M20-Fe13143	NCP	%	105			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M20-Fe13143	NCP	%	91			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M20-Fe13143	NCP	%	92			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M20-Fe13143	NCP	%	87			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M20-Fe13143	NCP	%	93			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M20-Fe13143	NCP	%	98			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M20-Fe13143	NCP	%	91			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	M20-Fe13143	NCP	%	88			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M20-Fe13143	NCP	%	95			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M20-Fe13143	NCP	%	81			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M20-Fe13143	NCP	%	88			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M20-Fe13143	NCP	%	80			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	B20-Fe10693	NCP	%	78			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M20-Fe13143	NCP	%	81			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M20-Fe13143	NCP	%	92			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	M20-Fe13143	NCP	%	107			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M20-Fe13143	NCP	%	104			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M20-Fe13143	NCP	%	92			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	B20-Fe13018	CP	%	15	13	13	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M20-Fe13142	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M20-Fe13142	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	B20-Fe10686	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	M20-Fe13142	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M20-Fe13142	NCP	ug/kg	< 5	< 5	<1	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

Ursula Long	Analytical Services Manager
Sarah McCallion	Senior Analyst-PFAS (QLD)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please click here.

NATA Accredited
Accreditation Number 1261
Site Number 18217

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

Nation Partners
306 / 50 Holt Street,
Surry Hills
NSW 2010

Attention: **Luke Clements**

Report **703149-S-V2**
Project name FRNSW TARRO
Project ID NP19039
Received Date Feb 20, 2020

Client Sample ID			FP3_0.0-0.2	FP4_0.0-0.2	FP5_0.0-0.2	FP6_0.0-0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N20-Fe27072	N20-Fe27073	N20-Fe27074	N20-Fe27075
Date Sampled			Feb 20, 2020	Feb 20, 2020	Feb 20, 2020	Feb 20, 2020
Test/Reference	LOR	Unit				
% Moisture	1	%	24	17	19	19
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanoic acid (PFHxA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroheptanoic acid (PFHpA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanoic acid (PFOA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanoic acid (PFNA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorodecanoic acid (PFDA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)N15	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)N11	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	54	73	75	80
13C5-PFPeA (surr.)	1	%	66	85	91	103
13C5-PFHxA (surr.)	1	%	65	90	86	90
13C4-PFHpA (surr.)	1	%	63	80	76	90
13C8-PFOA (surr.)	1	%	66	77	82	93
13C5-PFNA (surr.)	1	%	78	88	86	99
13C6-PFDA (surr.)	1	%	72	79	84	89
13C2-PFUnDA (surr.)	1	%	71	90	92	106
13C2-PFDoDA (surr.)	1	%	70	85	88	90
13C2-PFTeDA (surr.)	1	%	77	104	101	115
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)N11	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)N11	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)N11	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)N11	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)N11	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)N11	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)N11	10	ug/kg	< 10	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	59	73	72	82

Client Sample ID			FP3_0.0-0.2	FP4_0.0-0.2	FP5_0.0-0.2	FP6_0.0-0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N20-Fe27072	N20-Fe27073	N20-Fe27074	N20-Fe27075
Date Sampled			Feb 20, 2020	Feb 20, 2020	Feb 20, 2020	Feb 20, 2020
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonamido substances						
D3-N-MeFOSA (surr.)	1	%	48	72	73	79
D5-N-EtFOSA (surr.)	1	%	59	81	83	92
D7-N-MeFOSE (surr.)	1	%	32	57	59	59
D9-N-EtFOSE (surr.)	1	%	24	44	46	45
D5-N-EtFOSAA (surr.)	1	%	117	152	146	169
D3-N-MeFOSAA (surr.)	1	%	140	191	INT	INT
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]18	[N09]6.9	[N09]21	[N09]25
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	63	74	75	79
18O2-PFHxS (surr.)	1	%	61	70	70	80
13C8-PFOS (surr.)	1	%	59	71	68	82
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	129	128	128	159
13C2-6:2 FTSA (surr.)	1	%	183	95	120	133
13C2-8:2 FTSA (surr.)	1	%	116	95	89	116
13C2-10:2 FTSA (surr.)	1	%	70	76	80	92
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	18	6.9	21	25
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	18	6.9	21	25
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	18	6.9	21	25
Sum of WA DWER PFAS (n=10)*	10	ug/kg	18	< 10	21	25
Sum of PFASs (n=30)*	50	ug/kg	< 50	< 50	< 50	< 50

Client Sample ID			FP7_0.0-0.2	FP8_0.0-0.2	FP9_0.0-0.2	FP10_0.0-0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N20-Fe27076	N20-Fe27077	N20-Fe27078	N20-Fe27079
Date Sampled			Feb 20, 2020	Feb 20, 2020	Feb 20, 2020	Feb 20, 2020
Test/Reference	LOR	Unit				
% Moisture	1	%	30	17	14	15

Client Sample ID			FP7_0.0-0.2	FP8_0.0-0.2	FP9_0.0-0.2	FP10_0.0-0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N20-Fe27076	N20-Fe27077	N20-Fe27078	N20-Fe27079
Date Sampled			Feb 20, 2020	Feb 20, 2020	Feb 20, 2020	Feb 20, 2020
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	9.7	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	71	73	72	63
13C5-PFPeA (surr.)	1	%	86	87	88	71
13C5-PFHxA (surr.)	1	%	83	84	78	72
13C4-PFHpA (surr.)	1	%	75	83	71	66
13C8-PFOA (surr.)	1	%	78	81	77	71
13C5-PFNA (surr.)	1	%	82	81	86	74
13C6-PFDA (surr.)	1	%	77	77	79	70
13C2-PFUnDA (surr.)	1	%	84	93	93	82
13C2-PFDoDA (surr.)	1	%	82	85	81	74
13C2-PFTeDA (surr.)	1	%	104	107	93	94
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	69	77	67	63
D3-N-MeFOSA (surr.)	1	%	70	72	60	65
D5-N-EtFOSA (surr.)	1	%	81	87	72	74
D7-N-MeFOSE (surr.)	1	%	54	55	45	49
D9-N-EtFOSE (surr.)	1	%	36	49	34	42
D5-N-EtFOSAA (surr.)	1	%	150	157	141	137
D3-N-MeFOSAA (surr.)	1	%	182	INT	176	163
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	[N09]12	< 5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	[N09]8.7	< 5	< 5	< 5
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]110	[N09]140	[N09]33	[N09]150
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	[N09]19	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	74	69	65	68

Client Sample ID			FP7_0.0-0.2	FP8_0.0-0.2	FP9_0.0-0.2	FP10_0.0-0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N20-Fe27076	N20-Fe27077	N20-Fe27078	N20-Fe27079
Date Sampled			Feb 20, 2020	Feb 20, 2020	Feb 20, 2020	Feb 20, 2020
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonic acids (PFSAs)						
18O2-PFHxS (surr.)	1	%	69	76	68	63
13C8-PFOS (surr.)	1	%	67	67	68	54
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	126	143	119	105
13C2-6:2 FTSA (surr.)	1	%	114	121	124	99
13C2-8:2 FTSA (surr.)	1	%	83	83	96	71
13C2-10:2 FTSA (surr.)	1	%	77	87	81	70
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	118.7	140	33	150
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	110	140	33	150
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	118.7	140	33	150
Sum of WA DWER PFAS (n=10)*	10	ug/kg	118.7	140	33	150
Sum of PFASs (n=30)*	50	ug/kg	159.4	140	< 50	150

Client Sample ID			FP11_0.0-0.2	FP12_0.0-0.2	FP13_0.0-0.2	FP14_0.0-0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N20-Fe27080	N20-Fe27081	N20-Fe27082	N20-Fe27083
Date Sampled			Feb 20, 2020	Feb 20, 2020	Feb 20, 2020	Feb 20, 2020
Test/Reference	LOR	Unit				
% Moisture	1	%	20	24	17	13
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	76	72	77	83
13C5-PFPeA (surr.)	1	%	89	94	92	103
13C5-PFHxA (surr.)	1	%	92	84	90	94
13C4-PFHpA (surr.)	1	%	83	80	84	91
13C8-PFOA (surr.)	1	%	80	77	92	97
13C5-PFNA (surr.)	1	%	93	92	95	104
13C6-PFDA (surr.)	1	%	82	81	88	98
13C2-PFUnDA (surr.)	1	%	96	96	103	113

Client Sample ID			FP11_0.0-0.2	FP12_0.0-0.2	FP13_0.0-0.2	FP14_0.0-0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N20-Fe27080	N20-Fe27081	N20-Fe27082	N20-Fe27083
Date Sampled			Feb 20, 2020	Feb 20, 2020	Feb 20, 2020	Feb 20, 2020
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
13C2-PFDoDA (surr.)	1	%	84	82	87	96
13C2-PFTeDA (surr.)	1	%	116	115	110	126
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	80	74	79	91
D3-N-MeFOSA (surr.)	1	%	74	67	72	78
D5-N-EtFOSA (surr.)	1	%	83	77	86	87
D7-N-MeFOSE (surr.)	1	%	51	47	54	59
D9-N-EtFOSE (surr.)	1	%	38	40	40	39
D5-N-EtFOSAA (surr.)	1	%	159	160	163	179
D3-N-MeFOSAA (surr.)	1	%	195	191	200	INT
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]20	< 5	< 5	< 5
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	82	80	82	83
18O2-PFHxS (surr.)	1	%	74	73	77	77
13C8-PFOS (surr.)	1	%	75	73	76	85
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	138	122	121	149
13C2-6:2 FTSA (surr.)	1	%	90	100	160	193
13C2-8:2 FTSA (surr.)	1	%	83	101	107	120
13C2-10:2 FTSA (surr.)	1	%	82	91	93	98
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	20	< 5	< 5	< 5
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	20	< 5	< 5	< 5
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	20	< 5	< 5	< 5
Sum of WA DWER PFAS (n=10)*	10	ug/kg	20	< 10	< 10	< 10
Sum of PFASs (n=30)*	50	ug/kg	< 50	< 50	< 50	< 50

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Environment Testing

Client Sample ID			FP15_0.0-0.2	FP16_0.0-0.2	QC9	S16C_0.2-0.4
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N20-Fe27084	N20-Fe27085	N20-Fe27086	N20-Fe27092
Date Sampled			Feb 20, 2020	Feb 20, 2020	Feb 20, 2020	Feb 19, 2020
Test/Reference	LOR	Unit				
% Moisture	1	%	25	12	12	22
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA)N11	5	ug/kg	< 5	< 5	< 5	5.6
Perfluorohexanoic acid (PFHxA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroheptanoic acid (PFHpA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanoic acid (PFOA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanoic acid (PFNA)N11	5	ug/kg	< 5	< 5	< 5	6.5
Perfluorodecanoic acid (PFDA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)N15	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)N11	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	73	67	60	75
13C5-PFPeA (surr.)	1	%	94	81	71	95
13C5-PFHxA (surr.)	1	%	78	82	74	80
13C4-PFHpA (surr.)	1	%	73	73	65	83
13C8-PFOA (surr.)	1	%	79	73	68	73
13C5-PFNA (surr.)	1	%	82	82	74	84
13C6-PFDA (surr.)	1	%	76	78	67	73
13C2-PFUnDA (surr.)	1	%	96	82	82	92
13C2-PFDoDA (surr.)	1	%	82	77	73	88
13C2-PFTeDA (surr.)	1	%	106	90	84	114
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)N11	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)N11	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)N11	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)N11	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)N11	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)N11	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)N11	10	ug/kg	< 10	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	75	69	62	74
D3-N-MeFOSA (surr.)	1	%	76	64	55	75
D5-N-EtFOSA (surr.)	1	%	83	68	62	91
D7-N-MeFOSE (surr.)	1	%	56	48	43	55
D9-N-EtFOSE (surr.)	1	%	47	32	33	54
D5-N-EtFOSAA (surr.)	1	%	156	133	116	154
D3-N-MeFOSAA (surr.)	1	%	188	174	156	INT
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanesulfonic acid (PFNS)N15	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)N15	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)N15	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)N11	5	ug/kg	< 5	< 5	< 5	5.8
Perfluoroheptanesulfonic acid (PFHpS)N15	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanesulfonic acid (PFOS)N11	5	ug/kg	< 5	< 5	< 5	N09 170

Client Sample ID			FP15_0.0-0.2	FP16_0.0-0.2	QC9	S16C_0.2-0.4
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N20-Fe27084	N20-Fe27085	N20-Fe27086	N20-Fe27092
Date Sampled			Feb 20, 2020	Feb 20, 2020	Feb 20, 2020	Feb 19, 2020
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	73	76	64	73
18O2-PFHxS (surr.)	1	%	70	66	63	75
13C8-PFOS (surr.)	1	%	70	62	61	65
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	108	110	103	97
13C2-6:2 FTSA (surr.)	1	%	98	148	77	73
13C2-8:2 FTSA (surr.)	1	%	90	80	78	87
13C2-10:2 FTSA (surr.)	1	%	84	74	67	79
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	< 5	< 5	< 5	175.8
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	< 5	< 5	< 5	170
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	< 5	< 5	< 5	175.8
Sum of WA DWER PFAS (n=10)*	10	ug/kg	< 10	< 10	< 10	181.4
Sum of PFASs (n=30)*	50	ug/kg	< 50	< 50	< 50	187.9

Client Sample ID			S16C_0.4-0.6	S16A_0.2-0.4	S16A_0.4-0.6	S16B_0.2-0.4
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N20-Fe27093	N20-Fe27099	N20-Fe27100	N20-Fe27101
Date Sampled			Feb 19, 2020	Feb 19, 2020	Feb 19, 2020	Feb 19, 2020
Test/Reference	LOR	Unit				
% Moisture	1	%	20	20	20	17
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	7.9	7.8	6.6
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	17	36	40	28
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	11	30	32	16
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	5.8	15	13	7.6
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5	[N09]19	[N09]17	6.0
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	5.2	18	18	9.7
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	64	67	73	49
13C5-PFPeA (surr.)	1	%	72	79	83	60
13C5-PFHxA (surr.)	1	%	71	75	85	54
13C4-PFHpA (surr.)	1	%	70	66	76	54
13C8-PFOA (surr.)	1	%	72	72	75	54
13C5-PFNA (surr.)	1	%	71	77	80	53

Client Sample ID			S16C_0.4-0.6	S16A_0.2-0.4	S16A_0.4-0.6	S16B_0.2-0.4
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N20-Fe27093	N20-Fe27099	N20-Fe27100	N20-Fe27101
Date Sampled			Feb 19, 2020	Feb 19, 2020	Feb 19, 2020	Feb 19, 2020
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
13C6-PFDA (surr.)	1	%	65	48	51	50
13C2-PFUnDA (surr.)	1	%	86	87	98	71
13C2-PFDoDA (surr.)	1	%	78	80	93	61
13C2-PFTeDA (surr.)	1	%	100	101	119	75
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	69	68	76	55
D3-N-MeFOSA (surr.)	1	%	71	75	81	59
D5-N-EtFOSA (surr.)	1	%	82	85	93	64
D7-N-MeFOSE (surr.)	1	%	45	46	62	40
D9-N-EtFOSE (surr.)	1	%	49	49	56	33
D5-N-EtFOSAA (surr.)	1	%	136	145	161	111
D3-N-MeFOSAA (surr.)	1	%	168	172	193	135
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5	5.8	8.2	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	[N09]15	[N09]7.4	17
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5	5.8	[N09]6.3	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	[N09]9.8	[N09]63	[N09]52	[N09]20
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5	[N09]9.8	[N09]11	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]150	[N09]2200	[N09]1900	[N09]580
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5	< 5	[N09]18
13C3-PFBS (surr.)	1	%	72	71	73	51
18O2-PFHxS (surr.)	1	%	62	65	75	51
13C8-PFOS (surr.)	1	%	60	90	95	85
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	85	86	111	58
13C2-6:2 FTSA (surr.)	1	%	80	90	99	67
13C2-8:2 FTSA (surr.)	1	%	71	65	74	50
13C2-10:2 FTSA (surr.)	1	%	70	79	90	59

Client Sample ID			S16C_0.4-0.6	S16A_0.2-0.4	S16A_0.4-0.6	S16B_0.2-0.4
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N20-Fe27093	N20-Fe27099	N20-Fe27100	N20-Fe27101
Date Sampled			Feb 19, 2020	Feb 19, 2020	Feb 19, 2020	Feb 19, 2020
Test/Reference	LOR	Unit				
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	159.8	2263	1952	600
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	150	2219	1917	586
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	159.8	2282	1969	606
Sum of WA DWER PFAS (n=10)*	10	ug/kg	193.6	2376.7	2070	664.2
Sum of PFASs (n=30)*	50	ug/kg	198.8	2425.3	2112.7	708.9

Client Sample ID			S16B_0.4-0.6	QC4	TARRO_PIT 1	TARRO_PIT 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N20-Fe27102	N20-Fe27103	N20-Fe27109	N20-Fe27110
Date Sampled			Feb 19, 2020	Feb 19, 2020	Feb 20, 2020	Feb 20, 2020
Test/Reference	LOR	Unit				
% Moisture	1	%	25	22	59	40
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)N11	5	ug/kg	6.2	8.3	< 5	< 5
Perfluoropentanoic acid (PFPeA)N11	5	ug/kg	30	46	< 5	< 5
Perfluorohexanoic acid (PFHxA)N11	5	ug/kg	17	50	< 5	< 5
Perfluoroheptanoic acid (PFHpA)N11	5	ug/kg	9.5	24	< 5	< 5
Perfluorooctanoic acid (PFOA)N11	5	ug/kg	N09 7.8	N09 41	< 5	< 5
Perfluorononanoic acid (PFNA)N11	5	ug/kg	5.9	43	< 5	< 5
Perfluorodecanoic acid (PFDA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)N15	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)N11	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	87	68	42	61
13C5-PFPeA (surr.)	1	%	102	80	55	77
13C5-PFHxA (surr.)	1	%	105	81	45	73
13C4-PFHpA (surr.)	1	%	90	73	43	71
13C8-PFOA (surr.)	1	%	91	71	46	71
13C5-PFNA (surr.)	1	%	96	70	49	76
13C6-PFDA (surr.)	1	%	77	36	49	71
13C2-PFUnDA (surr.)	1	%	120	94	50	74
13C2-PFDoDA (surr.)	1	%	108	88	45	77
13C2-PFTeDA (surr.)	1	%	129	109	37	74
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)N11	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)N11	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)N11	5	ug/kg	< 5	< 5	5.2	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)N11	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)N11	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)N11	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)N11	10	ug/kg	< 10	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	89	75	37	54

Client Sample ID			S16B_0.4-0.6	QC4	TARRO_PIT 1	TARRO_PIT 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N20-Fe27102	N20-Fe27103	N20-Fe27109	N20-Fe27110
Date Sampled			Feb 19, 2020	Feb 19, 2020	Feb 20, 2020	Feb 20, 2020
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonamido substances						
D3-N-MeFOSA (surr.)	1	%	99	76	23	39
D5-N-EtFOSA (surr.)	1	%	114	94	33	59
D7-N-MeFOSE (surr.)	1	%	75	62	19	30
D9-N-EtFOSE (surr.)	1	%	73	50	17	26
D5-N-EtFOSAA (surr.)	1	%	196	152	66	99
D3-N-MeFOSAA (surr.)	1	%	INT	191	83	141
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5	11	< 5	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	[N09]13	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5	[N09]9.7	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	[N09]22	[N09]120	< 5	< 5
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5	[N09]27	< 5	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]610	[N09]2900	[N09]16	[N09]34
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	95	74	48	72
18O2-PFHxS (surr.)	1	%	85	60	51	66
13C8-PFOS (surr.)	1	%	122	98	87	67
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	118	95	63	114
13C2-6:2 FTSA (surr.)	1	%	104	81	69	96
13C2-8:2 FTSA (surr.)	1	%	99	70	55	107
13C2-10:2 FTSA (surr.)	1	%	103	78	38	64
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	632	3020	16	34
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	617.8	2941	16	34
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	639.8	3061	16	34
Sum of WA DWER PFAS (n=10)*	10	ug/kg	702.5	3200.3	16	34
Sum of PFASs (n=30)*	50	ug/kg	708.4	3293	< 50	< 50

Client Sample ID			FP1_0.0-0.2	FP2_0.0-0.2	S34_0.0-0.2	S34_0.2-0.4
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N20-Fe27111	N20-Fe27112	N20-Fe27129	N20-Fe27130
Date Sampled			Feb 20, 2020	Feb 20, 2020	Feb 19, 2020	Feb 19, 2020
Test/Reference	LOR	Unit				
% Moisture	1	%	23	21	20	19

Client Sample ID			FP1_0.0-0.2	FP2_0.0-0.2	S34_0.0-0.2	S34_0.2-0.4
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N20-Fe27111	N20-Fe27112	N20-Fe27129	N20-Fe27130
Date Sampled			Feb 20, 2020	Feb 20, 2020	Feb 19, 2020	Feb 19, 2020
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanoic acid (PFHxA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroheptanoic acid (PFHpA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanoic acid (PFOA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanoic acid (PFNA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorodecanoic acid (PFDA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)N15	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)N11	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	73	69	70	51
13C5-PFPeA (surr.)	1	%	94	83	86	64
13C5-PFHxA (surr.)	1	%	86	77	85	57
13C4-PFHpA (surr.)	1	%	79	73	86	55
13C8-PFOA (surr.)	1	%	82	83	86	56
13C5-PFNA (surr.)	1	%	94	84	95	58
13C6-PFDA (surr.)	1	%	85	78	77	49
13C2-PFUnDA (surr.)	1	%	91	92	97	69
13C2-PFDoDA (surr.)	1	%	90	82	90	67
13C2-PFTeDA (surr.)	1	%	92	92	115	76
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)N11	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)N11	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)N11	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)N11	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)N11	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)N11	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)N11	10	ug/kg	< 10	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	65	71	77	54
D3-N-MeFOSA (surr.)	1	%	56	62	75	58
D5-N-EtFOSA (surr.)	1	%	73	78	84	66
D7-N-MeFOSE (surr.)	1	%	44	44	46	38
D9-N-EtFOSE (surr.)	1	%	35	38	41	40
D5-N-EtFOSAA (surr.)	1	%	143	144	160	107
D3-N-MeFOSAA (surr.)	1	%	178	176	198	126
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanesulfonic acid (PFNS)N15	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)N15	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)N15	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)N11	5	ug/kg	< 5	< 5	< 5	5.5
Perfluoroheptanesulfonic acid (PFHpS)N15	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanesulfonic acid (PFOS)N11	5	ug/kg	N09 6.4	N09 47	N09 380	N09 270
Perfluorodecanesulfonic acid (PFDS)N15	5	ug/kg	< 5	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	75	72	80	52

Client Sample ID			FP1_0.0-0.2	FP2_0.0-0.2	S34_0.0-0.2	S34_0.2-0.4
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N20-Fe27111	N20-Fe27112	N20-Fe27129	N20-Fe27130
Date Sampled			Feb 20, 2020	Feb 20, 2020	Feb 19, 2020	Feb 19, 2020
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonic acids (PFSAs)						
18O2-PFHxS (surr.)	1	%	77	72	71	50
13C8-PFOS (surr.)	1	%	76	72	58	46
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)N11	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)N11	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)N11	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)N11	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	141	136	119	81
13C2-6:2 FTSA (surr.)	1	%	127	142	91	69
13C2-8:2 FTSA (surr.)	1	%	114	100	78	55
13C2-10:2 FTSA (surr.)	1	%	73	77	81	57
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	6.4	47	380	275.5
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	6.4	47	380	270
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	6.4	47	380	275.5
Sum of WA DWER PFAS (n=10)*	10	ug/kg	< 10	47	380	275.5
Sum of PFASs (n=30)*	50	ug/kg	< 50	< 50	380	275.5

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

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

Description	Testing Site	Extracted	Holding Time
% Moisture	Brisbane	Feb 20, 2020	14 Days
- Method: LTM-GEN-7080 Moisture			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Feb 24, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Feb 24, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Feb 24, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Feb 24, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

Company Name: Nation Partners Pty Ltd
Address: 306 / 50 Holt Street,
Surry Hills
NSW 2010

Project Name: FRNSW TARRO
Project ID: NP19039

Order No.:
Report #: 703149
Phone: 0405 821 580
Fax:

Received: Feb 20, 2020 11:10 AM
Due: Feb 27, 2020
Priority: 5 Day
Contact Name: Luke Clements

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						CANCELLED	HOLD	HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271										
Sydney Laboratory - NATA Site # 18217								X		
Brisbane Laboratory - NATA Site # 20794						X	X		X	X
Perth Laboratory - NATA Site # 23736										
External Laboratory										
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**					
1	FP3_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27072				X	X
2	FP4_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27073				X	X
3	FP5_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27074				X	X
4	FP6_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27075				X	X
5	FP7_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27076				X	X
6	FP8_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27077				X	X
7	FP9_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27078				X	X
8	FP10_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27079				X	X
9	FP11_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27080				X	X
10	FP12_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27081				X	X

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Melbourne Laboratory - NATA Site # 1254 & 14271										
Sydney Laboratory - NATA Site # 18217								X		
Brisbane Laboratory - NATA Site # 20794						X	X		X	X
Perth Laboratory - NATA Site # 23736										
11	FP13_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27082				X	X
12	FP14_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27083				X	X
13	FP15_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27084				X	X
14	FP16_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27085				X	X
15	QC9	Feb 20, 2020		Soil	N20-Fe27086				X	X
16	RINS_20022020	Feb 20, 2020		Water	N20-Fe27087					X
17	SW07	Feb 19, 2020		Water	N20-Fe27088					X
18	TARRO_PIT 1	Feb 19, 2020		Water	N20-Fe27089					X
19	TARRO_PIT 2	Feb 19, 2020		Water	N20-Fe27090					X
20	QC5	Feb 19, 2020		Soil	N20-Fe27091	X				
21	S16C_0.2-0.4	Feb 19, 2020		Soil	N20-Fe27092				X	X
22	S16C_0.4-0.6	Feb 19, 2020		Soil	N20-Fe27093				X	X

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		Phone:	0405 821 580	**Priority:**	5 Day
		Fax:		**Contact Name:**	Luke Clements
Project Name:	FRNSW TARRO				
Project ID:	NP19039				

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						CANCELLED	HOLD	HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271										
Sydney Laboratory - NATA Site # 18217								X		
Brisbane Laboratory - NATA Site # 20794						X	X		X	X
Perth Laboratory - NATA Site # 23736										
23	SW03	Feb 19, 2020		Water	N20-Fe27095					X
24	SW04	Feb 19, 2020		Water	N20-Fe27096					X
25	FIELD_BLANK_1902	Feb 19, 2020		Water	N20-Fe27097					X
26	SW07A	Feb 19, 2020		Water	N20-Fe27098					X
27	S16A_0.2-0.4	Feb 19, 2020		Soil	N20-Fe27099				X	X
28	S16A_0.4-0.6	Feb 19, 2020		Soil	N20-Fe27100				X	X
29	S16B_0.2-0.4	Feb 19, 2020		Soil	N20-Fe27101				X	X
30	S16B_0.4-0.6	Feb 19, 2020		Soil	N20-Fe27102				X	X
31	QC4	Feb 19, 2020		Soil	N20-Fe27103				X	X
32	MW03	Feb 20, 2020		Water	N20-Fe27106					X
33	MW02	Feb 20, 2020		Water	N20-Fe27107					X
34	MW01	Feb 20, 2020		Water	N20-Fe27108					X

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Melbourne Laboratory - NATA Site # 1254 & 14271										
Sydney Laboratory - NATA Site # 18217								X		
Brisbane Laboratory - NATA Site # 20794						X	X		X	X
Perth Laboratory - NATA Site # 23736										
35	TARRO_PIT 1	Feb 20, 2020		Soil	N20-Fe27109				X	X
36	TARRO_PIT 2	Feb 20, 2020		Soil	N20-Fe27110				X	X
37	FP1_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27111				X	X
38	FP2_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27112				X	X
39	TARRO_PIT 1	Feb 19, 2020		Soil	N20-Fe27113			X		
40	TARRO_PIT 2	Feb 19, 2020		Soil	N20-Fe27114			X		
41	S16B_0.6-0.8	Feb 19, 2020		Soil	N20-Fe27115		X			
42	S16C_0.6-0.8	Feb 19, 2020		Soil	N20-Fe27116		X			
43	S16D_0.2-0.4	Feb 19, 2020		Soil	N20-Fe27117		X			
44	S16D_0.4-0.6	Feb 19, 2020		Soil	N20-Fe27118		X			
45	S16D_0.6-0.8	Feb 19, 2020		Soil	N20-Fe27119		X			
46	S16E_0.2-0.4	Feb 19, 2020		Soil	N20-Fe27120		X			
47	S16E_0.4-0.6	Feb 19, 2020		Soil	N20-Fe27121		X			

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Melbourne Laboratory - NATA Site # 1254 & 14271										
Sydney Laboratory - NATA Site # 18217								X		
Brisbane Laboratory - NATA Site # 20794						X	X		X	X
Perth Laboratory - NATA Site # 23736										
48	S16E_0.6-0.8	Feb 19, 2020		Soil	N20-Fe27122		X			
49	S16F_0.2-0.4	Feb 19, 2020		Soil	N20-Fe27123		X			
50	S16F_0.4-0.6	Feb 19, 2020		Soil	N20-Fe27124		X			
51	S16F_0.6-0.8	Feb 19, 2020		Soil	N20-Fe27125		X			
52	QC6	Feb 19, 2020		Soil	N20-Fe27126		X			
53	S16A_0.6-0.8	Feb 19, 2020		Soil	N20-Fe27127		X			
54	QC7	Feb 19, 2020		Soil	N20-Fe27128		X			
55	S34_0.0-0.2	Feb 19, 2020		Soil	N20-Fe27129				X	X
56	S34_0.2-0.4	Feb 19, 2020		Soil	N20-Fe27130				X	X
57	S34_0.4-0.6	Feb 19, 2020		Soil	N20-Fe27131		X			
58	S34_0.6-0.8	Feb 19, 2020		Soil	N20-Fe27132		X			
59	S34_0.8-1.0	Feb 19, 2020		Soil	N20-Fe27133		X			
60	QC8	Feb 19, 2020		Soil	N20-Fe27134		X			

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Sample Detail	CANCELLED	HOLD	HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271					
Sydney Laboratory - NATA Site # 18217			X		
Brisbane Laboratory - NATA Site # 20794	X	X		X	X
Perth Laboratory - NATA Site # 23736					
Test Counts	1	20	20	28	39

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/kg	< 5			5	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/kg	< 5			5	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/kg	< 5			5	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	97			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	94			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	105			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	101			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	108			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	125			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	100			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	113			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	101			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	113			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	95			50-150	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	87			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	106			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	103			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	119			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	89			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	105			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	110			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	90			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	117			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	100			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	88			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	101			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	90			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	98			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	98			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	106			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	98			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	95			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	91			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	N20-Fe27080	CP	%	98			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	N20-Fe27080	CP	%	89			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	N20-Fe27080	CP	%	107			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	N20-Fe27080	CP	%	106			50-150	Pass	
Perfluorooctanoic acid (PFOA)	N20-Fe27080	CP	%	100			50-150	Pass	
Perfluorononanoic acid (PFNA)	N20-Fe27080	CP	%	122			50-150	Pass	
Perfluorodecanoic acid (PFDA)	N20-Fe27080	CP	%	102			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	N20-Fe27080	CP	%	117			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	N20-Fe27080	CP	%	111			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	N20-Fe27080	CP	%	125			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	N20-Fe27080	CP	%	101			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	N20-Fe27080	CP	%	89			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	N20-Fe27080	CP	%	107			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	N20-Fe27080	CP	%	98			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	N20-Fe27080	CP	%	74			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	N20-Fe27080	CP	%	107			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	N20-Fe27080	CP	%	106			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	N20-Fe27080	CP	%	106			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	N20-Fe27080	CP	%	89			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	N20-Fe27080	CP	%	111			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	N20-Fe27080	CP	%	98			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	N20-Fe27080	CP	%	83			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	N20-Fe27080	CP	%	95			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	N20-Fe27080	CP	%	94			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	N20-Fe27080	CP	%	64			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	N20-Fe27080	CP	%	93			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	N20-Fe27080	CP	%	114			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	N20-Fe27080	CP	%	88			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	N20-Fe27080	CP	%	100			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	N20-Fe27080	CP	%	89			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	N20-Fe27109	CP	%	92			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	N20-Fe27109	CP	%	90			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	N20-Fe27109	CP	%	96			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	N20-Fe27109	CP	%	107			50-150	Pass	
Perfluorooctanoic acid (PFOA)	N20-Fe27109	CP	%	89			50-150	Pass	
Perfluorononanoic acid (PFNA)	N20-Fe27109	CP	%	100			50-150	Pass	
Perfluorodecanoic acid (PFDA)	N20-Fe27109	CP	%	101			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	N20-Fe27109	CP	%	117			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	N20-Fe27109	CP	%	100			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	N20-Fe27109	CP	%	104			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	N20-Fe27109	CP	%	106			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	N20-Fe27109	CP	%	81			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	N20-Fe27109	CP	%	107			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	N20-Fe27109	CP	%	66			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	N20-Fe27109	CP	%	76			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	N20-Fe27109	CP	%	63			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	N20-Fe27109	CP	%	96			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	N20-Fe27109	CP	%	101			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	N20-Fe27109	CP	%	89			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	N20-Fe27109	CP	%	109			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	N20-Fe27109	CP	%	102			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	N20-Fe27109	CP	%	92			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	N20-Fe27109	CP	%	92			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	N20-Fe27109	CP	%	124			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	N20-Fe27109	CP	%	82			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	N20-Fe27109	CP	%	90			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	N20-Fe27109	CP	%	108			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	N20-Fe27109	CP	%	109			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	N20-Fe27109	CP	%	103			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	N20-Fe27109	CP	%	90			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	N20-Fe27127	CP	%	111			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	N20-Fe27127	CP	%	144			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	N20-Fe27127	CP	%	121			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	N20-Fe27127	CP	%	145			50-150	Pass	
Perfluorooctanoic acid (PFOA)	N20-Fe27127	CP	%	114			50-150	Pass	
Perfluorononanoic acid (PFNA)	N20-Fe27127	CP	%	142			50-150	Pass	
Perfluorodecanoic acid (PFDA)	N20-Fe27127	CP	%	120			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	N20-Fe27127	CP	%	128			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	N20-Fe27127	CP	%	118			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	N20-Fe27127	CP	%	135			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	N20-Fe27127	CP	%	108			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	N20-Fe27127	CP	%	106			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	N20-Fe27127	CP	%	117			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	N20-Fe27127	CP	%	110			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	N20-Fe27127	CP	%	128			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	N20-Fe27127	CP	%	105			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	N20-Fe27127	CP	%	114			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	N20-Fe27127	CP	%	124			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	N20-Fe27127	CP	%	132			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	N20-Fe27127	CP	%	121			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	N20-Fe27127	CP	%	109			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	N20-Fe27127	CP	%	134			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	N20-Fe27127	CP	%	ND			50-150	Fail	Q05
Perfluoroheptanesulfonic acid (PFHpS)	N20-Fe27127	CP	%	142			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	N20-Fe27127	CP	%	ND			50-150	Fail	Q05
Perfluorodecanesulfonic acid (PFDS)	N20-Fe27127	CP	%	130			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	N20-Fe27127	CP	%	127			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	N20-Fe27127	CP	%	93			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	N20-Fe27127	CP	%	112			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	N20-Fe27127	CP	%	105			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	

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Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	N20-Fe27079	CP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	N20-Fe27079	CP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	N20-Fe27079	CP	ug/kg	150	140	8.0	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	N20-Fe27079	CP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	N20-Fe27079	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	N20-Fe27085	CP	%	12	12	5.0	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	N20-Fe27092	CP	ug/kg	5.6	6.2	11	30%	Pass	
Perfluorohexanoic acid (PFHxA)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	N20-Fe27092	CP	ug/kg	6.5	7.1	8.0	30%	Pass	
Perfluorodecanoic acid (PFDA)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	

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Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorododecanoic acid (PFDoDA)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	N20-Fe27092	CP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	N20-Fe27092	CP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	N20-Fe27092	CP	ug/kg	5.8	6.2	7.0	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	N20-Fe27092	CP	ug/kg	170	200	17	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	N20-Fe27092	CP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	N20-Fe27092	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	N20-Fe27103	CP	ug/kg	8.3	9.8	16	30%	Pass	
Perfluoropentanoic acid (PFPeA)	N20-Fe27103	CP	ug/kg	46	56	19	30%	Pass	
Perfluorohexanoic acid (PFHxA)	N20-Fe27103	CP	ug/kg	50	58	15	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	N20-Fe27103	CP	ug/kg	24	24	1.0	30%	Pass	
Perfluorooctanoic acid (PFOA)	N20-Fe27103	CP	ug/kg	41	40	2.0	30%	Pass	
Perfluorononanoic acid (PFNA)	N20-Fe27103	CP	ug/kg	43	44	3.0	30%	Pass	

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Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorodecanoic acid (PFDA)	N20-Fe27103	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	N20-Fe27103	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	N20-Fe27103	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	N20-Fe27103	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	N20-Fe27103	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	N20-Fe27103	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	N20-Fe27103	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	N20-Fe27103	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	N20-Fe27103	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	N20-Fe27103	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	N20-Fe27103	CP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	N20-Fe27103	CP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	N20-Fe27103	CP	ug/kg	11	11	5.0	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	N20-Fe27103	CP	ug/kg	13	13	3.0	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	N20-Fe27103	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	N20-Fe27103	CP	ug/kg	9.7	10	7.0	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	N20-Fe27103	CP	ug/kg	120	110	7.0	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	N20-Fe27103	CP	ug/kg	27	27	1.0	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	N20-Fe27103	CP	ug/kg	2900	3500	16	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	N20-Fe27103	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	N20-Fe27103	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	N20-Fe27103	CP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	N20-Fe27103	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	N20-Fe27103	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	N20-Fe27109	CP	%	59	62	5.0	30%	Pass	

Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	N20-Fe27112	CP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	N20-Fe27112	CP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	N20-Fe27112	CP	ug/kg	47	49	4.0	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	N20-Fe27112	CP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	N20-Fe27112	CP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate									
				Result 1	Result 2	RPD			
% Moisture	N20-Fe27127	CP	%	23	22	2.0	30%	Pass	

Comments

This report has been revised (V2) to exclude samples N20-Fe27104 and N20-Fe27105 (migrated to report 704870).

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).
Q05	The matrix spike concentration is less than five times the background concentration in the sample - therefore the spike recovery cannot be determined

Authorised By

Ursula Long	Analytical Services Manager
Sarah McCallion	Senior Analyst-PFAS (QLD)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please click here.

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Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 18217

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

Nation Partners
306 / 50 Holt Street,
Surry Hills
NSW 2010

Attention:	**Luke Clements**
Report	**703149-W-V2**
Project name	FRNSW TARRO
Project ID	NP19039
Received Date	Feb 20, 2020

Client Sample ID			**RINS_20022020**	**SW07**	**TARRO_PIT 1**	**TARRO_PIT 2**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins Sample No.			**N20-Fe27087**	**N20-Fe27088**	**N20-Fe27089**	**N20-Fe27090**
Date Sampled			**Feb 20, 2020**	**Feb 19, 2020**	**Feb 19, 2020**	**Feb 19, 2020**
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	0.06
Perfluoropentanoic acid (PFPeA)[N11]	0.01	ug/L	< 0.01	< 0.01	0.03	0.08
Perfluorohexanoic acid (PFHxA)[N11]	0.01	ug/L	< 0.01	< 0.01	0.05	0.14
Perfluoroheptanoic acid (PFHpA)[N11]	0.01	ug/L	< 0.01	< 0.01	0.02	[N09]0.04
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	< 0.01	< 0.01	[N09]0.03	[N09]0.04
Perfluorononanoic acid (PFNA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTrDA)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	101	60	78	68
13C5-PFPeA (surr.)	1	%	166	80	105	87
13C5-PFHxA (surr.)	1	%	120	70	84	74
13C4-PFHpA (surr.)	1	%	134	88	114	101
13C8-PFOA (surr.)	1	%	130	96	120	110
13C5-PFNA (surr.)	1	%	164	103	141	129
13C6-PFDA (surr.)	1	%	176	101	134	126
13C2-PFUnDA (surr.)	1	%	154	77	102	98
13C2-PFDoDA (surr.)	1	%	123	66	82	84
13C2-PFTeDA (surr.)	1	%	102	73	78	88
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	77	60	94	95
D3-N-MeFOSA (surr.)	1	%	51	41	55	54

Client Sample ID			RINS_20022020	SW07	TARRO_PIT 1	TARRO_PIT 2
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			N20-Fe27087	N20-Fe27088	N20-Fe27089	N20-Fe27090
Date Sampled			Feb 20, 2020	Feb 19, 2020	Feb 19, 2020	Feb 19, 2020
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonamido substances						
D5-N-EtFOSA (surr.)	1	%	57	43	51	52
D7-N-MeFOSE (surr.)	1	%	87	52	63	63
D9-N-EtFOSE (surr.)	1	%	100	57	64	68
D5-N-EtFOSAA (surr.)	1	%	72	39	44	50
D3-N-MeFOSAA (surr.)	1	%	76	40	48	52
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	0.01	ug/L	< 0.01	0.02	0.02	0.10
Perfluorononanesulfonic acid (PFNS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.01	ug/L	< 0.01	0.01	0.01	0.05
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.01	ug/L	< 0.01	< 0.01	[N09]0.01	[N09]0.06
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	< 0.01	[N09]0.03	[N09]0.07	[N09]0.34
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	< 0.01	[N09]0.02	[N09]0.07	[N09]0.14
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	116	81	100	90
18O2-PFHxS (surr.)	1	%	108	77	100	91
13C8-PFOS (surr.)	1	%	115	73	103	97
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C2-4:2 FTSA (surr.)	1	%	177	107	127	120
13C2-6:2 FTSA (surr.)	1	%	155	166	188	191
13C2-8:2 FTSA (surr.)	1	%	135	79	111	112
13C2-10:2 FTSA (surr.)	1	%	157	78	104	103
PFASs Summations						
Sum (PFHxS + PFOS)*	0.01	ug/L	< 0.01	0.05	0.14	0.48
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	< 0.01	0.02	0.1	0.18
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	< 0.01	0.05	0.17	0.52
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	< 0.05	0.07	0.29	0.94
Sum of PFASs (n=30)*	0.1	ug/L	< 0.1	< 0.1	0.31	1.05

Client Sample ID			SW03	SW04	FIELD_BLANK_1902	SW07A
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			N20-Fe27095	N20-Fe27096	N20-Fe27097	N20-Fe27098
Date Sampled			Feb 19, 2020	Feb 19, 2020	Feb 19, 2020	Feb 19, 2020
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
Perfluoropentanoic acid (PFPeA)[N11]	0.01	ug/L	0.02	0.02	< 0.01	0.02
Perfluorohexanoic acid (PFHxA)[N11]	0.01	ug/L	0.02	0.02	< 0.01	0.03
Perfluoroheptanoic acid (PFHpA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	[N09]0.01	< 0.01	< 0.01	[N09]0.01

Client Sample ID			SW03	SW04	FIELD_BLANK _1902	SW07A
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			N20-Fe27095	N20-Fe27096	N20-Fe27097	N20-Fe27098
Date Sampled			Feb 19, 2020	Feb 19, 2020	Feb 19, 2020	Feb 19, 2020
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorononanoic acid (PFNA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTrDA)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	79	78	114	70
13C5-PFPeA (surr.)	1	%	107	102	176	85
13C5-PFHxA (surr.)	1	%	88	85	124	75
13C4-PFHpA (surr.)	1	%	105	99	143	93
13C8-PFOA (surr.)	1	%	114	108	145	107
13C5-PFNA (surr.)	1	%	131	128	171	123
13C6-PFDA (surr.)	1	%	122	126	190	131
13C2-PFUnDA (surr.)	1	%	94	95	166	109
13C2-PFDoDA (surr.)	1	%	79	79	130	96
13C2-PFTeDA (surr.)	1	%	76	79	89	74
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	85	82	80	89
D3-N-MeFOSA (surr.)	1	%	42	44	51	48
D5-N-EtFOSA (surr.)	1	%	45	49	57	52
D7-N-MeFOSE (surr.)	1	%	56	53	83	64
D9-N-EtFOSE (surr.)	1	%	60	60	95	74
D5-N-EtFOSAA (surr.)	1	%	75	71	106	106
D3-N-MeFOSAA (surr.)	1	%	82	76	124	109
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	0.01	ug/L	0.01	0.01	< 0.01	0.01
Perfluorononanesulfonic acid (PFNS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	[N09]0.06	[N09]0.06	< 0.01	[N09]0.07
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	[N09]0.08	[N09]0.08	< 0.01	[N09]0.05
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	97	95	122	91
18O2-PFHxS (surr.)	1	%	96	90	111	91
13C8-PFOS (surr.)	1	%	92	91	121	95

Client Sample ID			SW03	SW04	FIELD_BLANK_1902	SW07A
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			N20-Fe27095	N20-Fe27096	N20-Fe27097	N20-Fe27098
Date Sampled			Feb 19, 2020	Feb 19, 2020	Feb 19, 2020	Feb 19, 2020
Test/Reference	LOR	Unit				
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C2-4:2 FTSA (surr.)	1	%	140	137	188	128
13C2-6:2 FTSA (surr.)	1	%	INT	195	168	INT
13C2-8:2 FTSA (surr.)	1	%	131	131	164	149
13C2-10:2 FTSA (surr.)	1	%	103	104	157	176
PFASs Summations						
Sum (PFHxS + PFOS)*	0.01	ug/L	0.14	0.14	< 0.01	0.12
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	0.09	0.08	< 0.01	0.06
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	0.15	0.14	< 0.01	0.13
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	0.2	0.19	< 0.05	0.19
Sum of PFASs (n=30)*	0.1	ug/L	0.2	0.19	< 0.1	0.19

Client Sample ID			MW03	MW02	MW01
Sample Matrix			Water	Water	Water
Eurofins Sample No.			N20-Fe27106	N20-Fe27107	N20-Fe27108
Date Sampled			Feb 20, 2020	Feb 20, 2020	Feb 20, 2020
Test/Reference	LOR	Unit			
Perfluoroalkyl carboxylic acids (PFCAs)					
Perfluorobutanoic acid (PFBA)[N11]	0.05	ug/L	< 0.05	0.06	< 0.05
Perfluoropentanoic acid (PFPeA)[N11]	0.01	ug/L	< 0.01	0.10	< 0.01
Perfluorohexanoic acid (PFHxA)[N11]	0.01	ug/L	< 0.01	0.11	< 0.01
Perfluoroheptanoic acid (PFHpA)[N11]	0.01	ug/L	< 0.01	[N09]0.02	< 0.01
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	< 0.01	[N09]0.01	< 0.01
Perfluorononanoic acid (PFNA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTrDA)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	118	80	69
13C5-PFPeA (surr.)	1	%	176	122	128
13C5-PFHxA (surr.)	1	%	126	101	91
13C4-PFHpA (surr.)	1	%	145	136	109
13C8-PFOA (surr.)	1	%	151	131	111
13C5-PFNA (surr.)	1	%	150	149	119
13C6-PFDA (surr.)	1	%	134	137	113
13C2-PFUnDA (surr.)	1	%	102	128	108
13C2-PFDoDA (surr.)	1	%	94	116	105
13C2-PFTeDA (surr.)	1	%	31	55	52

Client Sample ID			MW03	MW02	MW01
Sample Matrix			Water	Water	Water
Eurofins Sample No.			N20-Fe27106	N20-Fe27107	N20-Fe27108
Date Sampled			Feb 20, 2020	Feb 20, 2020	Feb 20, 2020
Test/Reference	LOR	Unit			
Perfluoroalkyl sulfonamido substances					
Perfluorooctane sulfonamide (FOSA)N11	0.05	ug/L	< 0.05	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)N11	0.05	ug/L	< 0.05	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)N11	0.05	ug/L	< 0.05	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)N11	0.05	ug/L	< 0.05	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)N11	0.05	ug/L	< 0.05	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)N11	0.05	ug/L	< 0.05	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)N11	0.05	ug/L	< 0.05	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	72	95	78
D3-N-MeFOSA (surr.)	1	%	38	109	91
D5-N-EtFOSA (surr.)	1	%	32	114	96
D7-N-MeFOSE (surr.)	1	%	55	93	81
D9-N-EtFOSE (surr.)	1	%	55	104	94
D5-N-EtFOSAA (surr.)	1	%	10	38	41
D3-N-MeFOSAA (surr.)	1	%	INT	35	43
Perfluoroalkyl sulfonic acids (PFSAs)					
Perfluorobutanesulfonic acid (PFBS)N11	0.01	ug/L	< 0.01	0.06	< 0.01
Perfluorononanesulfonic acid (PFNS)N15	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS)N15	0.01	ug/L	< 0.01	0.02	< 0.01
Perfluoropentanesulfonic acid (PFPeS)N15	0.01	ug/L	< 0.01	N09 0.04	< 0.01
Perfluorohexanesulfonic acid (PFHxS)N11	0.01	ug/L	N09 0.01	N09 0.17	< 0.01
Perfluoroheptanesulfonic acid (PFHpS)N15	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluorooctanesulfonic acid (PFOS)N11	0.01	ug/L	N09 0.02	N09 0.09	< 0.01
Perfluorodecanesulfonic acid (PFDS)N15	0.01	ug/L	< 0.01	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	121	124	94
18O2-PFHxS (surr.)	1	%	124	126	111
13C8-PFOS (surr.)	1	%	114	121	99
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)N11	0.01	ug/L	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)N11	0.05	ug/L	< 0.05	< 0.05	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)N11	0.01	ug/L	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)N11	0.01	ug/L	< 0.01	< 0.01	< 0.01
13C2-4:2 FTSA (surr.)	1	%	104	118	104
13C2-6:2 FTSA (surr.)	1	%	98	91	78
13C2-8:2 FTSA (surr.)	1	%	86	69	61
13C2-10:2 FTSA (surr.)	1	%	84	80	67
PFASs Summations					
Sum (PFHxS + PFOS)*	0.01	ug/L	0.03	0.26	< 0.01
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	0.02	0.1	< 0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	0.03	0.27	< 0.01
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	< 0.05	0.62	< 0.05
Sum of PFASs (n=30)*	0.1	ug/L	< 0.1	0.68	< 0.1

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

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

Description	Testing Site	Extracted	Holding Time
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Feb 21, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Feb 21, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Feb 21, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Feb 21, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

eurofins | Environment Testing

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Site # 1254 & 14271

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Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
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Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
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NATA # 1261
Site # 23736

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Rolleston, Christchurch 7675
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IANZ # 1290

Company Name: Nation Partners Pty Ltd
Address: 306 / 50 Holt Street,
Surry Hills
NSW 2010

Project Name: FRNSW TARRO
Project ID: NP19039

Order No.:
Report #: 703149
Phone: 0405 821 580
Fax:

Received: Feb 20, 2020 11:10 AM
Due: Feb 27, 2020
Priority: 5 Day
Contact Name: Luke Clements

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						CANCELLED	HOLD	HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271										
Sydney Laboratory - NATA Site # 18217								X		
Brisbane Laboratory - NATA Site # 20794						X	X		X	X
Perth Laboratory - NATA Site # 23736										
External Laboratory										
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**					
1	FP3_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27072				X	X
2	FP4_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27073				X	X
3	FP5_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27074				X	X
4	FP6_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27075				X	X
5	FP7_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27076				X	X
6	FP8_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27077				X	X
7	FP9_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27078				X	X
8	FP10_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27079				X	X
9	FP11_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27080				X	X
10	FP12_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27081				X	X

eurofins Environment Testing

ABN – 50 005 085 521 web : www.eurofins.com.au e.mail : EnviroSales@eurofins.com

Australia

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Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

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Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
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NATA # 1261
Site # 23736

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Phone : 0800 856 450
IANZ # 1290

Company Name: Nation Partners Pty Ltd
Address: 306 / 50 Holt Street,
Surry Hills
NSW 2010

Project Name: FRNSW TARRO
Project ID: NP19039

Order No.:
Report #: 703149
Phone: 0405 821 580
Fax:

Received: Feb 20, 2020 11:10 AM
Due: Feb 27, 2020
Priority: 5 Day
Contact Name: Luke Clements

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						CANCELLED	HOLD	HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271										
Sydney Laboratory - NATA Site # 18217								X		
Brisbane Laboratory - NATA Site # 20794						X	X		X	X
Perth Laboratory - NATA Site # 23736										
11	FP13_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27082				X	X
12	FP14_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27083				X	X
13	FP15_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27084				X	X
14	FP16_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27085				X	X
15	QC9	Feb 20, 2020		Soil	N20-Fe27086				X	X
16	RINS_20022020	Feb 20, 2020		Water	N20-Fe27087					X
17	SW07	Feb 19, 2020		Water	N20-Fe27088					X
18	TARRO_PIT 1	Feb 19, 2020		Water	N20-Fe27089					X
19	TARRO_PIT 2	Feb 19, 2020		Water	N20-Fe27090					X
20	QC5	Feb 19, 2020		Soil	N20-Fe27091	X				
21	S16C_0.2-0.4	Feb 19, 2020		Soil	N20-Fe27092				X	X
22	S16C_0.4-0.6	Feb 19, 2020		Soil	N20-Fe27093				X	X

Company Name: Nation Partners Pty Ltd
Address: 306 / 50 Holt Street,
Surry Hills
NSW 2010

Project Name: FRNSW TARRO
Project ID: NP19039

Order No.:
Report #: 703149
Phone: 0405 821 580
Fax:

Received: Feb 20, 2020 11:10 AM
Due: Feb 27, 2020
Priority: 5 Day
Contact Name: Luke Clements

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						CANCELLED	HOLD	HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271										
Sydney Laboratory - NATA Site # 18217								X		
Brisbane Laboratory - NATA Site # 20794						X	X		X	X
Perth Laboratory - NATA Site # 23736										
23	SW03	Feb 19, 2020		Water	N20-Fe27095					X
24	SW04	Feb 19, 2020		Water	N20-Fe27096					X
25	FIELD_BLANK_1902	Feb 19, 2020		Water	N20-Fe27097					X
26	SW07A	Feb 19, 2020		Water	N20-Fe27098					X
27	S16A_0.2-0.4	Feb 19, 2020		Soil	N20-Fe27099				X	X
28	S16A_0.4-0.6	Feb 19, 2020		Soil	N20-Fe27100				X	X
29	S16B_0.2-0.4	Feb 19, 2020		Soil	N20-Fe27101				X	X
30	S16B_0.4-0.6	Feb 19, 2020		Soil	N20-Fe27102				X	X
31	QC4	Feb 19, 2020		Soil	N20-Fe27103				X	X
32	MW03	Feb 20, 2020		Water	N20-Fe27106					X
33	MW02	Feb 20, 2020		Water	N20-Fe27107					X
34	MW01	Feb 20, 2020		Water	N20-Fe27108					X

Company Name:	Nation Partners Pty Ltd	**Order No.:**		**Received:**	Feb 20, 2020 11:10 AM
Address:	306 / 50 Holt Street, Surry Hills NSW 2010	**Report #:**	703149	**Due:**	Feb 27, 2020
		Phone:	0405 821 580	**Priority:**	5 Day
		Fax:		**Contact Name:**	Luke Clements
Project Name:	FRNSW TARRO				
Project ID:	NP19039				

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						CANCELLED	HOLD	HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271										
Sydney Laboratory - NATA Site # 18217								X		
Brisbane Laboratory - NATA Site # 20794						X	X		X	X
Perth Laboratory - NATA Site # 23736										
35	TARRO_PIT 1	Feb 20, 2020		Soil	N20-Fe27109				X	X
36	TARRO_PIT 2	Feb 20, 2020		Soil	N20-Fe27110				X	X
37	FP1_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27111				X	X
38	FP2_0.0-0.2	Feb 20, 2020		Soil	N20-Fe27112				X	X
39	TARRO_PIT 1	Feb 19, 2020		Soil	N20-Fe27113			X		
40	TARRO_PIT 2	Feb 19, 2020		Soil	N20-Fe27114			X		
41	S16B_0.6-0.8	Feb 19, 2020		Soil	N20-Fe27115		X			
42	S16C_0.6-0.8	Feb 19, 2020		Soil	N20-Fe27116		X			
43	S16D_0.2-0.4	Feb 19, 2020		Soil	N20-Fe27117		X			
44	S16D_0.4-0.6	Feb 19, 2020		Soil	N20-Fe27118		X			
45	S16D_0.6-0.8	Feb 19, 2020		Soil	N20-Fe27119		X			
46	S16E_0.2-0.4	Feb 19, 2020		Soil	N20-Fe27120		X			
47	S16E_0.4-0.6	Feb 19, 2020		Soil	N20-Fe27121		X			

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Company Name:	Nation Partners Pty Ltd	**Order No.:**		**Received:**	Feb 20, 2020 11:10 AM
Address:	306 / 50 Holt Street, Surry Hills NSW 2010	**Report #:**	703149	**Due:**	Feb 27, 2020
		Phone:	0405 821 580	**Priority:**	5 Day
		Fax:		**Contact Name:**	Luke Clements
Project Name:	FRNSW TARRO				
Project ID:	NP19039				

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						CANCELLED	HOLD	HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271										
Sydney Laboratory - NATA Site # 18217								X		
Brisbane Laboratory - NATA Site # 20794						X	X		X	X
Perth Laboratory - NATA Site # 23736										
48	S16E_0.6-0.8	Feb 19, 2020		Soil	N20-Fe27122		X			
49	S16F_0.2-0.4	Feb 19, 2020		Soil	N20-Fe27123		X			
50	S16F_0.4-0.6	Feb 19, 2020		Soil	N20-Fe27124		X			
51	S16F_0.6-0.8	Feb 19, 2020		Soil	N20-Fe27125		X			
52	QC6	Feb 19, 2020		Soil	N20-Fe27126		X			
53	S16A_0.6-0.8	Feb 19, 2020		Soil	N20-Fe27127		X			
54	QC7	Feb 19, 2020		Soil	N20-Fe27128		X			
55	S34_0.0-0.2	Feb 19, 2020		Soil	N20-Fe27129				X	X
56	S34_0.2-0.4	Feb 19, 2020		Soil	N20-Fe27130				X	X
57	S34_0.4-0.6	Feb 19, 2020		Soil	N20-Fe27131		X			
58	S34_0.6-0.8	Feb 19, 2020		Soil	N20-Fe27132		X			
59	S34_0.8-1.0	Feb 19, 2020		Soil	N20-Fe27133		X			
60	QC8	Feb 19, 2020		Soil	N20-Fe27134		X			

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IANZ # 1290

Company Name: Nation Partners Pty Ltd
Address: 306 / 50 Holt Street,
Surry Hills
NSW 2010

Project Name: FRNSW TARRO
Project ID: NP19039

Order No.:
Report #: 703149
Phone: 0405 821 580
Fax:

Received: Feb 20, 2020 11:10 AM
Due: Feb 27, 2020
Priority: 5 Day
Contact Name: Luke Clements

Eurofins Analytical Services Manager : Ursula Long

Sample Detail	CANCELLED	HOLD	HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271					
Sydney Laboratory - NATA Site # 18217			X		
Brisbane Laboratory - NATA Site # 20794	X	X		X	X
Perth Laboratory - NATA Site # 23736					
Test Counts	1	20	20	28	39

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	105			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	107			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	116			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	107			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	112			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	115			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	80			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	107			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	119			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	78			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	107			50-150	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	124			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	97			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	102			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	91			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	87			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	92			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	92			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	90			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	106			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	109			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	89			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	105			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	89			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	107			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	95			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	121			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	101			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	111			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	93			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	N20-Fe27089	CP	%	108			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	N20-Fe27089	CP	%	97			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	N20-Fe27089	CP	%	137			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	N20-Fe27089	CP	%	108			50-150	Pass	
Perfluorooctanoic acid (PFOA)	N20-Fe27089	CP	%	107			50-150	Pass	
Perfluorononanoic acid (PFNA)	N20-Fe27089	CP	%	126			50-150	Pass	
Perfluorodecanoic acid (PFDA)	N20-Fe27089	CP	%	105			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	N20-Fe27089	CP	%	129			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	N20-Fe27089	CP	%	146			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	N20-Fe27089	CP	%	114			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	N20-Fe27089	CP	%	139			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	N20-Fe27089	CP	%	105			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	N20-Fe27089	CP	%	111			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	N20-Fe27089	CP	%	114			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	N20-Fe27089	CP	%	100			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	N20-Fe27089	CP	%	111			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	N20-Fe27089	CP	%	121			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	N20-Fe27089	CP	%	114			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	N20-Fe27089	CP	%	86			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	N20-Fe27089	CP	%	118			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	N20-Fe27089	CP	%	127			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	N20-Fe27089	CP	%	88			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	N20-Fe27089	CP	%	132			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	N20-Fe27089	CP	%	102			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	N20-Fe27089	CP	%	125			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	N20-Fe27089	CP	%	110			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	N20-Fe27089	CP	%	117			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	N20-Fe27089	CP	%	138			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	N20-Fe27089	CP	%	114			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	N20-Fe27089	CP	%	93			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	N20-Fe27106	CP	%	98			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	N20-Fe27106	CP	%	85			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	N20-Fe27106	CP	%	106			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	N20-Fe27106	CP	%	104			50-150	Pass	
Perfluorooctanoic acid (PFOA)	N20-Fe27106	CP	%	93			50-150	Pass	
Perfluorononanoic acid (PFNA)	N20-Fe27106	CP	%	110			50-150	Pass	
Perfluorodecanoic acid (PFDA)	N20-Fe27106	CP	%	97			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	N20-Fe27106	CP	%	100			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	N20-Fe27106	CP	%	113			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	N20-Fe27106	CP	%	115			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	N20-Fe27106	CP	%	118			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	N20-Fe27106	CP	%	103			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	N20-Fe27106	CP	%	91			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	N20-Fe27106	CP	%	84			50-150	Pass	

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Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	N20-Fe27106	CP	%	87			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	N20-Fe27106	CP	%	85			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	N20-Fe27106	CP	%	96			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	N20-Fe27106	CP	%	84			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	N20-Fe27106	CP	%	83			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	N20-Fe27106	CP	%	88			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	N20-Fe27106	CP	%	101			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	N20-Fe27106	CP	%	80			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	N20-Fe27106	CP	%	106			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	N20-Fe27106	CP	%	98			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	N20-Fe27106	CP	%	76			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	N20-Fe27106	CP	%	82			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	N20-Fe27106	CP	%	100			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	N20-Fe27106	CP	%	104			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	N20-Fe27106	CP	%	96			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	N20-Fe27106	CP	%	75			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	N20-Fe27087	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	N20-Fe27087	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	N20-Fe27087	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	N20-Fe27087	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	N20-Fe27087	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	N20-Fe27087	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	N20-Fe27087	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	N20-Fe27087	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	N20-Fe27087	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	N20-Fe27087	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	N20-Fe27088	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	N20-Fe27088	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	N20-Fe27088	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	N20-Fe27088	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	N20-Fe27088	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	N20-Fe27088	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	N20-Fe27088	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	N20-Fe27088	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	N20-Fe27088	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	N20-Fe27088	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	N20-Fe27088	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	N20-Fe27088	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	N20-Fe27088	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	N20-Fe27088	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	N20-Fe27088	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	N20-Fe27088	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	N20-Fe27088	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	N20-Fe27088	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	N20-Fe27088	CP	ug/L	0.02	0.02	2.0	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	N20-Fe27088	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	N20-Fe27088	CP	ug/L	0.01	0.01	4.0	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	N20-Fe27088	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	N20-Fe27088	CP	ug/L	0.03	0.03	3.0	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	N20-Fe27088	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	N20-Fe27088	CP	ug/L	0.02	0.02	2.0	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	N20-Fe27088	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	N20-Fe27088	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	N20-Fe27088	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	N20-Fe27088	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	N20-Fe27088	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	N20-Fe27107	CP	ug/L	0.06	0.07	19	30%	Pass	
Perfluoropentanoic acid (PFPeA)	N20-Fe27107	CP	ug/L	0.10	0.12	15	30%	Pass	
Perfluorohexanoic acid (PFHxA)	N20-Fe27107	CP	ug/L	0.11	0.12	12	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	N20-Fe27107	CP	ug/L	0.02	0.02	8.0	30%	Pass	
Perfluorooctanoic acid (PFOA)	N20-Fe27107	CP	ug/L	0.01	0.01	14	30%	Pass	
Perfluorononanoic acid (PFNA)	N20-Fe27107	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	N20-Fe27107	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	N20-Fe27107	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	N20-Fe27107	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	N20-Fe27107	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	N20-Fe27107	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	N20-Fe27107	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	N20-Fe27107	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	N20-Fe27107	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	N20-Fe27107	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	N20-Fe27107	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	N20-Fe27107	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	N20-Fe27107	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	N20-Fe27107	CP	ug/L	0.06	0.06	2.0	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	N20-Fe27107	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	N20-Fe27107	CP	ug/L	0.02	0.02	3.0	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	N20-Fe27107	CP	ug/L	0.04	0.05	16	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	N20-Fe27107	CP	ug/L	0.17	0.19	11	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	N20-Fe27107	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	N20-Fe27107	CP	ug/L	0.09	0.10	9.0	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	N20-Fe27107	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	N20-Fe27107	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	N20-Fe27107	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	N20-Fe27107	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	N20-Fe27107	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Comments

This report has been revised (V2) to exclude samples N20-Fe27104 and N20-Fe27105 (migrated to report 704870).

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

Ursula Long	Analytical Services Manager
Sarah McCallion	Senior Analyst-PFAS (QLD)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please click here.

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Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 20794

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

Nation Partners
306 / 50 Holt Street,
Surry Hills
NSW 2010

Attention: **Luke Clements**

Report	**708095-S-V2**
Project name	FRNSW TARRO
Project ID	NP 19039
Received Date	Mar 16, 2020

Client Sample ID			**SD10**
Sample Matrix			**Soil**
Eurofins Sample No.			**B20-Ma23967**
Date Sampled			**Mar 16, 2020**
Test/Reference	LOR	Unit	
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	7.6
Total Organic Carbon	0.1	%	1.9
% Moisture	1	%	23
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5
13C4-PFBA (surr.)	1	%	88
13C5-PFPeA (surr.)	1	%	99
13C5-PFHxA (surr.)	1	%	105
13C4-PFHpA (surr.)	1	%	95
13C8-PFOA (surr.)	1	%	108
13C5-PFNA (surr.)	1	%	95
13C6-PFDA (surr.)	1	%	121
13C2-PFUnDA (surr.)	1	%	103
13C2-PFDoDA (surr.)	1	%	100
13C2-PFTeDA (surr.)	1	%	116
Perfluoroalkyl sulfonamido substances			
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	5	ug/kg	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	5	ug/kg	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10

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Client Sample ID			SD10
Sample Matrix			Soil
Eurofins Sample No.			B20-Ma23967
Date Sampled			Mar 16, 2020
Test/Reference	LOR	Unit	
Perfluoroalkyl sulfonamido substances			
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10
13C8-FOSA (surr.)	1	%	83
D3-N-MeFOSA (surr.)	1	%	85
D5-N-EtFOSA (surr.)	1	%	84
D7-N-MeFOSE (surr.)	1	%	43
D9-N-EtFOSE (surr.)	1	%	43
D5-N-EtFOSAA (surr.)	1	%	129
D3-N-MeFOSAA (surr.)	1	%	116
Perfluoroalkyl sulfonic acids (PFSAs)			
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	< 5
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	6.2
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5
13C3-PFBS (surr.)	1	%	98
18O2-PFHxS (surr.)	1	%	99
13C8-PFOS (surr.)	1	%	101
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5
13C2-4:2 FTSA (surr.)	1	%	117
13C2-6:2 FTSA (surr.)	1	%	117
13C2-8:2 FTSA (surr.)	1	%	141
13C2-10:2 FTSA (surr.)	1	%	173
PFASs Summations			
Sum (PFHxS + PFOS)*	5	ug/kg	6.2
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	6.2
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	6.2
Sum of WA DWER PFAS (n=10)*	10	ug/kg	< 10
Sum of PFASs (n=30)*	50	ug/kg	< 50

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Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

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

Description	Testing Site	Extracted	Holding Time
pH (1:5 Aqueous extract at 25°C as rec.)	Melbourne	Mar 18, 2020	7 Days
- Method: LTM-GEN-7090 pH in soil by ISE			
Total Organic Carbon	Melbourne	Mar 18, 2020	28 Days
- Method: LTM-INO-4060 Total Organic Carbon in water and soil			
% Moisture	Brisbane	Mar 19, 2020	14 Days
- Method: LTM-GEN-7080 Moisture			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Mar 17, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Mar 17, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Mar 18, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Mar 18, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

Company Name:	Nation Partners Pty Ltd	**Order No.:**		**Received:**	Mar 16, 2020 1:15 PM
Address:	306 / 50 Holt Street, Surry Hills NSW 2010	**Report #:**	708095	**Due:**	Mar 19, 2020
		Phone:	0405 821 580	**Priority:**	3 Day
		Fax:		**Contact Name:**	Luke Clements
Project Name:	FRNSW TARRO				
Project ID:	NP 19039				

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	Total Organic Carbon	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X		
Sydney Laboratory - NATA Site # 18217									
Brisbane Laboratory - NATA Site # 20794								X	X
Perth Laboratory - NATA Site # 23736									
External Laboratory									
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**				
1	SW10	Mar 16, 2020		Water	B20-Ma23966				X
2	SD10	Mar 16, 2020		Soil	B20-Ma23967	X	X	X	X
Test Counts						1	1	1	2

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
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7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
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For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
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SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Organic Carbon	%	< 0.1			0.1	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/kg	< 5			5	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/kg	< 5			5	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/kg	< 5			5	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	111			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	103			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	110			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	110			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	113			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	108			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	111			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	129			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	117			50-150	Pass	

eurofins Environment Testing

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorotridecanoic acid (PFTrDA)	%	110			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	110			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	117			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	120			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	119			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	119			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	121			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	111			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	118			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	100			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	140			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	95			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	97			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	106			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	107			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	104			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	99			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	117			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	114			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	123			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	103			50-150	Pass	

Comments

This report has been revised (V2) to amend QC duplicate results for PFHxS and PFOS.

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

Ursula Long	Analytical Services Manager
Sarah McCallion	Senior Analyst-PFAS (QLD)
Scott Beddoes	Senior Analyst-Inorganic (VIC)

Glenn Jackson

General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please click here.

NATA Accredited
Accreditation Number 1261
Site Number 20794

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

Nation Partners
306 / 50 Holt Street,
Surry Hills
NSW 2010

Attention:	**Luke Clements**
Report	**708095-W-V2**
Project name	FRNSW TARRO
Project ID	NP 19039
Received Date	Mar 16, 2020

Client Sample ID			**SW10**
Sample Matrix			**Water**
Eurofins Sample No.			**B20-Ma23966**
Date Sampled			**Mar 16, 2020**
Test/Reference	LOR	Unit	
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA)N11	0.05	ug/L	0.05
Perfluoropentanoic acid (PFPeA)N11	0.01	ug/L	0.14
Perfluorohexanoic acid (PFHxA)N11	0.01	ug/L	0.16
Perfluoroheptanoic acid (PFHpA)N11	0.01	ug/L	N09 0.04
Perfluorooctanoic acid (PFOA)N11	0.01	ug/L	N09 0.04
Perfluorononanoic acid (PFNA)N11	0.01	ug/L	0.02
Perfluorodecanoic acid (PFDA)N11	0.01	ug/L	< 0.01
Perfluoroundecanoic acid (PFUnDA)N11	0.01	ug/L	< 0.01
Perfluorododecanoic acid (PFDoDA)N11	0.01	ug/L	< 0.01
Perfluorotridecanoic acid (PFTrDA)N15	0.01	ug/L	< 0.01
Perfluorotetradecanoic acid (PFTeDA)N11	0.01	ug/L	< 0.01
13C4-PFBA (surr.)	1	%	103
13C5-PFPeA (surr.)	1	%	98
13C5-PFHxA (surr.)	1	%	96
13C4-PFHpA (surr.)	1	%	127
13C8-PFOA (surr.)	1	%	141
13C5-PFNA (surr.)	1	%	138
13C6-PFDA (surr.)	1	%	92
13C2-PFUnDA (surr.)	1	%	123
13C2-PFDoDA (surr.)	1	%	135
13C2-PFTeDA (surr.)	1	%	118
Perfluoroalkyl sulfonamido substances			
Perfluorooctane sulfonamide (FOSA)N11	0.05	ug/L	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)N11	0.05	ug/L	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)N11	0.05	ug/L	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)N11	0.05	ug/L	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)N11	0.05	ug/L	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)N11	0.05	ug/L	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)N11	0.05	ug/L	< 0.05
13C8-FOSA (surr.)	1	%	93
D3-N-MeFOSA (surr.)	1	%	71
D5-N-EtFOSA (surr.)	1	%	72

Client Sample ID			SW10
Sample Matrix			Water
Eurofins Sample No.			B20-Ma23966
Date Sampled			Mar 16, 2020
Test/Reference	LOR	Unit	
Perfluoroalkyl sulfonamido substances			
D7-N-MeFOSE (surr.)	1	%	70
D9-N-EtFOSE (surr.)	1	%	81
D5-N-EtFOSAA (surr.)	1	%	INT
D3-N-MeFOSAA (surr.)	1	%	INT
Perfluoroalkyl sulfonic acids (PFSAs)			
Perfluorobutanesulfonic acid (PFBS)[N11]	0.01	ug/L	0.06
Perfluorononanesulfonic acid (PFNS)[N15]	0.01	ug/L	< 0.01
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.01	ug/L	0.02
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.01	ug/L	[N09]0.05
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	[N09]0.38
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	[N09]0.03
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	[N09]1.2
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01
13C3-PFBS (surr.)	1	%	147
18O2-PFHxS (surr.)	1	%	129
13C8-PFOS (surr.)	1	%	113
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	0.05	ug/L	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	0.01	ug/L	< 0.01
13C2-4:2 FTSA (surr.)	1	%	107
13C2-6:2 FTSA (surr.)	1	%	128
13C2-8:2 FTSA (surr.)	1	%	90
13C2-10:2 FTSA (surr.)	1	%	80
PFASs Summations			
Sum (PFHxS + PFOS)*	0.01	ug/L	1.58
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	1.24
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	1.62
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	2.07
Sum of PFASs (n=30)*	0.1	ug/L	2.19

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

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

Description	Testing Site	Extracted	Holding Time
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Mar 17, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Mar 17, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Mar 17, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Mar 17, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

eurofins Environment Testing

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NATA # 1261 Site # 20794

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NATA # 1261
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IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name:	Nation Partners Pty Ltd	**Order No.:**		**Received:**	Mar 16, 2020 1:15 PM
Address:	306 / 50 Holt Street, Surry Hills NSW 2010	**Report #:**	708095	**Due:**	Mar 19, 2020
		Phone:	0405 821 580	**Priority:**	3 Day
		Fax:		**Contact Name:**	Luke Clements
Project Name:	FRNSW TARRO				
Project ID:	NP 19039				

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	Total Organic Carbon	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X		
Sydney Laboratory - NATA Site # 18217									
Brisbane Laboratory - NATA Site # 20794								X	X
Perth Laboratory - NATA Site # 23736									
External Laboratory									
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**				
1	SW10	Mar 16, 2020		Water	B20-Ma23966				X
2	SD10	Mar 16, 2020		Soil	B20-Ma23967	X	X	X	X
Test Counts						1	1	1	2

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
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org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	99			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	90			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	93			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	97			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	91			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	110			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	94			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	92			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	112			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	63			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	65			50-150	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	71			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	63			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	59			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	70			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	62			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	128			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	115			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	80			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	89			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	91			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	87			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	101			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	78			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	95			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	58			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	62			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	80			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	111			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	103			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M20-Ma22423	NCP	ug/L	0.46	0.45	3.0	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M20-Ma22423	NCP	ug/L	0.58	0.57	2.0	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M20-Ma22423	NCP	ug/L	2.9	2.8	1.0	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M20-Ma22423	NCP	ug/L	0.17	0.18	4.0	30%	Pass	
Perfluorooctanoic acid (PFOA)	M20-Ma22423	NCP	ug/L	0.48	0.48	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M20-Ma22423	NCP	ug/L	0.05	0.05	5.0	30%	Pass	
Perfluorodecanoic acid (PFDA)	M20-Ma22423	NCP	ug/L	0.04	0.04	2.0	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	M20-Ma22423	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	M20-Ma22423	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	M20-Ma22423	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M20-Ma22423	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	M20-Ma22423	NCP	ug/L	0.07	0.07	6.0	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M20-Ma22423	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M20-Ma22423	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M20-Ma22423	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M20-Ma22423	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	

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Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M20-Ma22423	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M20-Ma22423	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	M20-Ma22423	NCP	ug/L	0.17	0.19	10	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	M20-Ma22423	NCP	ug/L	0.38	0.40	4.0	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M20-Ma22423	NCP	ug/L	0.10	0.09	6.0	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M20-Ma22423	NCP	ug/L	0.23	0.24	6.0	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M20-Ma22423	NCP	ug/L	2.5	2.2	11	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M20-Ma22423	NCP	ug/L	0.25	0.24	5.0	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	M20-Ma22423	NCP	ug/L	32	26	20	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	M20-Ma22423	NCP	ug/L	0.02	0.02	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M20-Ma22423	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	M20-Ma22423	NCP	ug/L	2.4	2.4	2.0	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M20-Ma22423	NCP	ug/L	0.43	0.42	1.0	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M20-Ma22423	NCP	ug/L	0.03	0.03	4.0	30%	Pass	

Comments

This report has been revised (V2) to amend QC duplicate results for PFHxS and PFOS.

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

Ursula Long	Analytical Services Manager
Sarah McCallion	Senior Analyst-PFAS (QLD)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please click here.

SOLUTIONS FOR
COMPLEX PROJECTS

Appendix B –
HHRA Risk Model

General Information

Site:	OLOL Primary School
Address:	Tarro
Client:	FR NSW

Receptors and Exposure Pathways

Receptors	On-Site	Off-Site	Exposure Scenarios
Adults and children that attend OLOL Primary School (on-site)	x		Incidental Ingestion of Soil
			Incidental Ingestion of Surface Water
	x		Inhalation of soil derived dust in outdoor air
	x		Ingestion of home grown produce (fruits and vegetables)
	x		Ingestion of home grown produce (chicken eggs)
Residents that inhabit properties adjacent to the Site (off-site)		x	Incidental Ingestion of Soil
			Incidental Ingestion of Surface Water
		x	Inhalation of soil derived dust in indoor air
		x	Inhalation of soil derived dust in outdoor air
		x	Ingestion of home grown produce (fruits and vegetables)
		x	Ingestion of home grown produce (chicken eggs)
Recreational receptors that use Tarro Reserve			Incidental Ingestion of Soil
		x	Incidental Ingestion of Surface Water

Exposure Point Concentrations

Contaminant of Potential Concern (CoPC)	units	EPC	Source/Justification
Soil (On-Site)			
Perfluorooctane sulfonate (PFOS)	mg/kg	2.5	maximum reported concentration in on-site soils sampled between 0 - 0.4 m bgl
Perfluorooctanoic acid (PFOA)	mg/kg	0.078	
Perfluorohexane sulfonate (PFHxS)	mg/kg	0.32	
Perfluorohexanoic acid (PFHxA)	mg/kg	0.073	
Soil (Off-Site)			
Perfluorooctane sulfonate (PFOS)	mg/kg	0.15	maximum reported concentration in off-site soils sampled between 0 - 0.4 m bgl
Perfluorooctanoic acid (PFOA)	mg/kg	0.005	
Perfluorohexane sulfonate (PFHxS)	mg/kg	0.009	
Perfluorohexanoic acid (PFHxA)	mg/kg	0.005	
Surface Water (Off-Site)			
Perfluorooctane sulfonate (PFOS)	mg/L	0.0012	maximum reported concentration in off-site surface water sampled from stormwater drainage channels and the waterbody located in Tarro Reserve
Perfluorooctanoic acid (PFOA)	mg/L	0.00004	
Perfluorohexane sulfonate (PFHxS)	mg/L	0.00038	
Perfluorohexanoic acid (PFHxA)	mg/L	0.00016	
Soil Concentrations used to Estimate Home Grown Produce Exposure (On-Site)			
Perfluorooctane sulfonate (PFOS)	mg/kg	2.5	maximum reported concentration in on-site soils sampled between 0 - 0.4 m bgl
Perfluorooctanoic acid (PFOA)	mg/kg	0.078	
Perfluorohexane sulfonate (PFHxS)	mg/kg	0.32	
Perfluorohexanoic acid (PFHxA)	mg/kg	0.073	
Soil Concentration used to Estimated Home Grown Produce Exposure (Off-Site)			
Perfluorooctane sulfonate (PFOS)	mg/kg	0.15	maximum reported concentration in off-site soils sampled between 0 - 0.4 m bgl
Perfluorooctanoic acid (PFOA)	mg/kg	0.005	
Perfluorohexane sulfonate (PFHxS)	mg/kg	0.009	
Perfluorohexanoic acid (PFHxA)	mg/kg	0.005	

Toxicity Assessment

CoPC	Tolerable Daily Intake (TDI) mg/kg/day	Background Intake (ingestion) mg/kg/day	Tolerable Daily Intake (TDI) - Background Adjusted mg/kg/day	Background Intake (inhalation) mg/m3	Tolerable Concentration in Air (RfC) (calculated from TDI) mg/m3	Oral Bioavaiability unitless
Perfluorooctane sulfonate (PFOS)	2.00E-05	1.40E-06	1.86E-05	0.00E+00	7.00E-05	1.00
Perfluorooctanoic acid (PFOA)	1.60E-04	7.80E-07	1.59E-04	0.00E+00	5.60E-04	1.00
Perfluorohexane sulfonate (PFHxS)	2.00E-05	0.00E+00	2.00E-05	0.00E+00	7.00E-05	1.00
Perfluorohexanoic acid (PFHxA)	1.00E-01	0.00E+00	1.00E-01	0.00E+00	3.50E-01	1.00

Exposure Parameters

		Adults and children that attend OLOL Primary School (on-site)			
General	**units**	**Adult**	**Reference**	**Child**	**Reference**
Body weight	kg	70	NEPC (2013)	24	The average body weight of children aged 4 to <8 years old as listed in the enHealth (2012) exposure factors guide has been adopted as children who attend the primary school will be 5 years old (or older).
Exposure duration	yr	30	Assumes teachers may work at the same school for up to 30 years.	8	It is assumed that children will attend the school from kindergarten through to grade six plus the potential for a child to repeat up to one year of schooling.
Averaging time (non-carcinogens)	yr	30	Assumes teachers may work at the same school for up to 30 years.	8	It is assumed that children will attend the school from kindergarten through to grade six plus the potential for a child to repeat up to one year of schooling.
Incidental Soil Ingestion					
Daily soil ingestion rate	mg/day	50	NEPC (2013)	100	NEPC (2013)
Exposure frequency for soil ingestion	days/yr	210	Site-specific assumption - assumes teachers will be at school for 4 x 10 week terms plus som additional days if they attend the school on the weekend or where terms are slightly longer than 10 weeks.	210	Site-specific assumption - assumes children will be at school for 4 x 10 week terms plus som additional days if they play at the school on the weekend or where terms are slightly longer than 10 weeks.
Outdoor Inhalation					
Exposure time (outdoor air)	hrs/day	4	This assumes that teachers may spend up to 4 hours per day in the school yard.	4	This assumes thatchildren may spend up to 4 hours per day in the school yard.
Exposure time (indoor air)	hrs/day	4	This assumes that teachers may spend up to 4 hours per day in classroom.	4	This assumes that children may spend up to 4 hours per day in the classroom.
Exposure frequency (outdoor air)	days/yr	210	Site-specific assumption - assumes teachers will be at school for 4 x 10 week terms plus som additional days if they attend the school on the weekend or where terms are slightly longer than 10 weeks.	210	Site-specific assumption - assumes children will be at school for 4 x 10 week terms plus som additional days if they play at the school on the weekend or where terms are slightly longer than 10 weeks.
Particulate emission factor (outdoor air)	m3/kg	2.60E+07	NEPC (2013) - Recreational User PEF has been adopted.	2.60E+07	NEPC (2013) - Recreational User PEF has been adopted.
Indoor Air Dust Factor	m3/kg	2.60E+07	NEPC (2013)	2.60E+07	NEPC (2013)
Lung Retention Factor (dust inhalation)	unitless	0.375	NEPC (2013)	0.375	NEPC (2013)
Ingestion of Home Grown Produce					
Fraction of produce consumed from the site	%	10%	NEPC (2013)	10%	NEPC (2013)
Exposure Frequency	days/year	210	NEPC (2013)	210	NEPC (2013)
Consumption Rate - Chicken Eggs	g/day	59	FSANZ (2017) P90 value for people aged 2 years and above	36	FSANZ (2017) P90 value for children aged 2-6
Consumption Rate - Fruit	kg/day	0.14	NEPC (2013)	0.18	NEPC (2013)
Consumption Rate - Green Vegetables	kg/day	0.15	NEPC (2013) assumes 59% of vegetables consumed (260 g/day) are green vegetables	0.055	NEPC (2013) assumes 55% of vegetables consumed (100 g/day) are green vegetables
Consumption Rate - Tuber Vegetables	kg/day	0.060	NEPC (2013) assumes 23% of vegetables consumed (260 g/day) are tuber vegetables	0.028	NEPC (2013) assumes 28% of vegetables consumed (100 g/day) are tuber vegetables
Consumption Rate - Root Vegetables	kg/day	0.047	NEPC (2013) assumes 18% of vegetables consumed (260 g/day) are root vegetables	0.017	NEPC (2013) assumes 17% of vegetables consumed (100 g/day) are root vegetables

Chicken Egg Transfer Factors	unit	value	Reference
Fraction of plant type grown on contaminated soil and ingested by the animal (chicken)	unitless	1	Professional judgement. Assumed 100% from source area
Quantity of plant type eaten by the animal each day	kg DW plant/day	0.105	Professional judgement, based on information provided by NSW department of agriculture (https://www.dpi.nsw.gov.au/animals-and-livestock/poultry-and-birds/poultry-planning-and-keeping/planning-for-poultry-development/bpm)
Quantity of soil eaten by the animal	kg/day	0.0105	Professional judgement. Assumes 10% of feed quantity may be made up of soil
Quantity of water consumed by the animal	L/day	0.208	Professional judgement, based on information provided by NSW department of agriculture (https://www.dpi.nsw.gov.au/animals-and-livestock/poultry-and-birds/poultry-planning-and-keeping/planning-for-poultry-development/bpm)
Laying Rate	eggs/day	0.9	Professional judgement.
Average weight of edible portion of the egg	kg	0.0563	Scolexia (2017)

Chicken Egg Transfer Factors	unit	value	Reference
Perfluorooctane sulfonate (PFOS)	unitless	1	These values have been adopted from a report conducted by Scolexia/AECOM (2017) as part of the Department of Defence investigation at RAAF Williamtown. This study investigated PFAS uptake from drinking water into chicken eggs.
Perfluorooctanoic acid (PFOA)	unitless	0.46	
Perfluorohexane sulfonate (PFHxS)	unitless	0.69	
Perfluorohexanoic acid (PFHxA)	unitless	0.005	

Soil-Fruit Concentration Factor	unit	value	Reference
Perfluorooctane sulfonate (PFOS)	mg-chem/kg-plant per mg-chem/kg-soil	0.02	NSW OEH (2019) - values adopted in the derivation of human health soil screening criteria for PFOS, PFHxS and PFOA.
Perfluorooctanoic acid (PFOA)	mg-chem/kg-plant per mg-chem/kg-soil	0.03	
Perfluorohexane sulfonate (PFHxS)	mg-chem/kg-plant per mg-chem/kg-soil	0.02	
Perfluorohexanoic acid (PFHxA)	mg-chem/kg-plant per mg-chem/kg-soil	0	

Soil-Green Vegetable Concentration Factor	unit	value	Reference
Perfluorooctane sulfonate (PFOS)	mg-chem/kg-plant per mg-chem/kg-soil	0.79	NSW OEH (2019) - values adopted in the derivation of human health soil screening criteria for PFOS, PFHxS and PFOA.
Perfluorooctanoic acid (PFOA)	mg-chem/kg-plant per mg-chem/kg-soil	0.1	
Perfluorohexane sulfonate (PFHxS)	mg-chem/kg-plant per mg-chem/kg-soil	0.79	
Perfluorohexanoic acid (PFHxA)	mg-chem/kg-plant per mg-chem/kg-soil	0	

Human Health Risk Assessment Model

Soil-Tuber Vegetable Concentration Factor	unit	value	Reference
Perfluorooctane sulfonate (PFOS)	mg-chem/kg-plant per mg-chem/kg-soil	0.2	NSW OEH (2019) - values adopted in the derivation of human health soil screening criteria for PFOS, PFHxS and PFOA.
Perfluorooctanoic acid (PFOA)	mg-chem/kg-plant per mg-chem/kg-soil	0.03	
Perfluorohexane sulfonate (PFHxS)	mg-chem/kg-plant per mg-chem/kg-soil	0.2	
Perfluorohexanoic acid (PFHxA)	mg-chem/kg-plant per mg-chem/kg-soil	0	

Soil-Root Vegetable Concentration Factor	unit	value	Reference
Perfluorooctane sulfonate (PFOS)	mg-chem/kg-plant per mg-chem/kg-soil	0.51	NSW OEH (2019) - values adopted in the derivation of human health soil screening criteria for PFOS, PFHxS and PFOA.
Perfluorooctanoic acid (PFOA)	mg-chem/kg-plant per mg-chem/kg-soil	0.15	
Perfluorohexane sulfonate (PFHxS)	mg-chem/kg-plant per mg-chem/kg-soil	0.51	
Perfluorohexanoic acid (PFHxA)	mg-chem/kg-plant per mg-chem/kg-soil	0	

Risk Characterisation

Adults and children that attend OLOL Primary School (on-site)

ADULT

CoPC	Exposure Point Concentration in Soil	Hazard Quotient (HQ)	TDI (Background Adjusted)	Chronic Daily Intake (non-carcinogens)	Ingestion Rate	Oral Bioavailability	Exposure Frequency	Exposure Duration	Fraction Ingested from Contaminated Source	Averaging Time (non-carcinogens)	Body Weight
Incidental Ingestion of Soil	mg/kg	unitless	mg/kg/day	mg/kg/day	mg/day	unitless	days/year	years	unitless	years	kg
Perfluorooctane sulfonate (PFOS)	2.5	5.52E-02	1.86E-05	1.03E-06	50	1	210	30	1	30	70
Perfluorooctanoic acid (PFOA)	0.078	2.01E-04	1.59E-04	3.21E-08	50	1	210	30	1	30	70
Perfluorohexane sulfonate (PFHxS)	0.32	6.58E-03	2.00E-05	1.32E-07	50	1	210	30	1	30	70
Perfluorohexanoic acid (PFHxA)	0.073	3.00E-07	1.00E-01	3.00E-08	50	1	210	30	1	30	70
Exposure Pathway Specific Hazard Index		**6.20E-02**									

Inhalation of soil derived dust in outdoor air	Exposure Point Concentration in Soil	Hazard Quotient (HQ)	RfC (Background Adjusted)	Exposure Adjusted Air Concentration	Concentration in Air (outdoors)	Particulate Emission Factor	Lung Retention Factor (RF)	Oral Bioavailability	Exposure Time	Exposure Frequency	Exposure Duration	Averaging Time (non-carcinogens)	Body Weight
	mg/kg	unitless	mg/m3	mg/m3	mg/m3	m3/kg	unitless	unitless	hours/day	days/year	years	years	kg
Perfluorooctane sulfonate (PFOS)	2.5	4.94E-05	7.00E-05	3.46E-09	9.62E-08	2.60E+07	3.75E-01	1	4	210	30	30	70
Perfluorooctanoic acid (PFOA)	0.078	1.93E-07	5.60E-04	1.08E-10	3.00E-09	2.60E+07	3.75E-01	1	4	210	30	30	70
Perfluorohexane sulfonate (PFHxS)	0.32	6.32E-06	7.00E-05	4.43E-10	1.23E-08	2.60E+07	3.75E-01	1	4	210	30	30	70
Perfluorohexanoic acid (PFHxA)	0.073	2.88E-10	3.50E-01	1.01E-10	2.81E-09	2.60E+07	3.75E-01	1	4	210	30	30	70
Exposure Pathway Specific Hazard Index		**5.59E-05**											

Inhalation of soil derived dust in indoor air	Exposure Point Concentration in Soil	Hazard Quotient (HQ)	RfC (Background Adjusted)	Exposure Adjusted Air Concentration	Concentration in Air (indoors)	Particulate Emission Factor	Lung Retention Factor (RF)	Oral Bioavailability	Exposure Time	Exposure Frequency	Exposure Duration	Averaging Time (non-carcinogens)	Body Weight
	mg/kg	unitless	mg/m3	mg/m3	mg/m3	m3/kg	unitless	unitless	hours/day	days/year	years	years	kg
Perfluorooctane sulfonate (PFOS)	2.5	4.94E-05	7.00E-05	3.46E-09	9.62E-08	2.60E+07	3.75E-01	1	4	210	30	30	70
Perfluorooctanoic acid (PFOA)	0.078	1.93E-07	5.60E-04	1.08E-10	3.00E-09	2.60E+07	3.75E-01	1	4	210	30	30	70
Perfluorohexane sulfonate (PFHxS)	0.32	6.32E-06	7.00E-05	4.43E-10	1.23E-08	2.60E+07	3.75E-01	1	4	210	30	30	70
Perfluorohexanoic acid (PFHxA)	0.073	2.88E-10	3.50E-01	1.01E-10	2.81E-09	2.60E+07	3.75E-01	1	4	210	30	30	70
Exposure Pathway Specific Hazard Index		**5.59E-05**											

Ingestion of Home Grown Produce - Chicken Eggs	Exposure Point Concentration in Soil	Hazard Quotient (HQ)	TDI (Background Adjusted)	Chronic Daily Intake (non-carcinogens)	Concentration in Eggs	Egg Transfer Factor	Egg Consumption Rate	Oral Bioavailability	Exposure Frequency	Exposure Duration	Fraction Ingested from Contaminated Source	Averaging Time (non-carcinogens)	Body Weight
	mg/kg	unitless	mg/kg/day	mg/kg/day	mg/kg	unitless	mg/day	unitless	days/year	years	unitless	years	kg
Perfluorooctane sulfonate (PFOS)	2.5	1.20E+01	1.86E-05	2.24E-04	4.61E+00	1.00E+00	59000	1	210	30	0.1	30	70
Perfluorooctanoic acid (PFOA)	0.078	4.53E-03	1.59E-04	7.21E-07	1.49E-02	4.60E-01	59000	1	210	30	0.1	30	70
Perfluorohexane sulfonate (PFHxS)	0.32	9.87E-01	2.00E-05	1.97E-05	4.07E-01	6.90E-01	59000	1	210	30	0.1	30	70
Perfluorohexanoic acid (PFHxA)	0.073	3.67E-08	1.00E-01	3.67E-09	7.56E-05	5.00E-03	59000	1	210	30	0.1	30	70
Exposure Pathway Specific Hazard Index		**1.30E+01**											

Ingestion of Home Grown Produce - Fruits and Vegetables	Exposure Point Concentration in Soil	Hazard Quotient (HQ)	TDI (Background Adjusted)	Chronic Daily Intake (non-carcinogens)	Plant Intake Factor	Oral Bioavailability	Exposure Frequency	Exposure Duration	Fraction Ingested from Contaminated Source	Averaging Time (non-carcinogens)	Body Weight
	mg/kg	unitless	mg/kg/day	mg/kg/day	kg/day	unitless	days/year	years	unitless	years	kg
Perfluorooctane sulfonate (PFOS)	2.5	1.77E-05	1.86E-05	3.28E-10	1.60E-01	1	210	30	0.1	30	70
Perfluorooctanoic acid (PFOA)	0.078	1.14E-08	1.59E-04	1.82E-12	2.84E-02	1	210	30	0.1	30	70
Perfluorohexane sulfonate (PFHxS)	0.32	2.10E-06	2.00E-05	4.20E-11	1.60E-01	1	210	30	0.1	30	70
Perfluorohexanoic acid (PFHxA)	0.073	0.00E+00	1.00E-01	0.00E+00	0.00E+00	1	210	30	0.1	30	70
Exposure Pathway Specific Hazard Index		**1.98E-05**									

Hazard Index	**1.31E+01**

Human Health Risk Assessment Model

CHILD

CoPC Incidental Ingestion of Soil	Exposure Point Concentration in Soil mg/kg	Hazard Quotient (HQ) unitless	TDI (Background Adjusted) mg/kg/day	Chronic Daily Intake (non-carcinogens) mg/kg/day	Ingestion Rate mg/day	Oral Bioavailability unitless	Exposure Frequency days/year	Exposure Duration years	Fraction Ingested from Contaminated Source unitless	Averaging Time (non-carcinogens) years	Body Weight kg
Perfluorooctane sulfonate (PFOS)	2.5	3.22E-01	1.86E-05	5.99E-06	100	1	210	8	1	8	24
Perfluorooctanoic acid (PFOA)	0.078	1.17E-03	1.59E-04	1.87E-07	100	1	210	8	1	8	24
Perfluorohexane sulfonate (PFHxS)	0.32	3.84E-02	2.00E-05	7.67E-07	100	1	210	8	1	8	24
Perfluorohexanoic acid (PFHxA)	0.073	1.75E-06	1.00E-01	1.75E-07	100	1	210	8	1	8	24
Exposure Pathway Specific Hazard Index		**3.62E-01**									

Inhalation of soil derived dust in outdoor air	Exposure Point Concentration in Soil mg/kg	Hazard Quotient (HQ) unitless	RfC (Background Adjusted) mg/m3	Exposure Adjusted Air Concentration mg/m3	Concentration in Air (outdoors) mg/m3	Particulate Emission Factor m3/kg	Lung Retention Factor (RF) unitless	Oral Bioavailability unitless	Exposure Time hours/day	Exposure Frequency days/year	Exposure Duration years	Averaging Time (non-carcinogens) years	Body Weight kg
Perfluorooctane sulfonate (PFOS)	2.5	4.94E-05	7.00E-05	3.46E-09	9.62E-08	2.60E+07	3.75E-01	1	4	210	8	8	24
Perfluorooctanoic acid (PFOA)	0.078	1.93E-07	5.60E-04	1.08E-10	3.00E-09	2.60E+07	3.75E-01	1	4	210	8	8	24
Perfluorohexane sulfonate (PFHxS)	0.32	6.32E-06	7.00E-05	4.43E-10	1.23E-08	2.60E+07	3.75E-01	1	4	210	8	8	24
Perfluorohexanoic acid (PFHxA)	0.073	2.88E-10	3.50E-01	1.01E-10	2.81E-09	2.60E+07	3.75E-01	1	4	210	8	8	24
Exposure Pathway Specific Hazard Index		**5.59E-05**											

Inhalation of soil derived dust in indoor air	Exposure Point Concentration in Soil mg/kg	Hazard Quotient (HQ) unitless	RfC (Background Adjusted) mg/m3	Exposure Adjusted Air Concentration mg/m3	Concentration in Air (indoors) mg/m3	Particulate Emission Factor m3/kg	Lung Retention Factor (RF) unitless	Oral Bioavailability unitless	Exposure Time hours/day	Exposure Frequency days/year	Exposure Duration years	Averaging Time (non-carcinogens) years	Body Weight kg
Perfluorooctane sulfonate (PFOS)	2.5	4.94E-05	7.00E-05	3.46E-09	9.62E-08	2.60E+07	3.75E-01	1	4	210	8	8	24
Perfluorooctanoic acid (PFOA)	0.078	1.93E-07	5.60E-04	1.08E-10	3.00E-09	2.60E+07	3.75E-01	1	4	210	8	8	24
Perfluorohexane sulfonate (PFHxS)	0.32	6.32E-06	7.00E-05	4.43E-10	1.23E-08	2.60E+07	3.75E-01	1	4	210	8	8	24
Perfluorohexanoic acid (PFHxA)	0.073	2.88E-10	3.50E-01	1.01E-10	2.81E-09	2.60E+07	3.75E-01	1	4	210	8	8	24
Exposure Pathway Specific Hazard Index		**5.59E-05**											

Ingestion of Home Grown Produce - Chicken Eggs	Exposure Point Concentration in Soil mg/kg	Hazard Quotient (HQ) unitless	TDI (Background Adjusted) mg/kg/day	Chronic Daily Intake (non-carcinogens) mg/kg/day	Concentration in Eggs mg/kg	Egg Transfer Factor unitless	Egg Consumption Rate mg/day	Oral Bioavailability unitless	Exposure Frequency days/year	Exposure Duration years	Fraction Ingested from Contaminated Source unitless	Averaging Time (non-carcinogens) years	Body Weight kg
Perfluorooctane sulfonate (PFOS)	2.5	2.14E+01	1.86E-05	3.98E-04	4.61E+00	1.00E+00	36000	1	210	8	0.1	8	24
Perfluorooctanoic acid (PFOA)	0.078	8.06E-03	1.59E-04	1.28E-06	1.49E-02	4.60E-01	36000	1	210	8	0.1	8	24
Perfluorohexane sulfonate (PFHxS)	0.32	1.76E+00	2.00E-05	3.51E-05	4.07E-01	6.90E-01	36000	1	210	8	0.1	8	24
Perfluorohexanoic acid (PFHxA)	0.073	6.53E-08	1.00E-01	6.53E-09	7.56E-05	5.00E-03	36000	1	210	8	0.1	8	24
Exposure Pathway Specific Hazard Index		**2.32E+01**											

Ingestion of Home Grown Produce - Fruits and Vegetables	Exposure Point Concentration in Soil mg/kg	Hazard Quotient (HQ) unitless	TDI (Background Adjusted) mg/kg/day	Chronic Daily Intake (non-carcinogens) mg/kg/day	Plant Intake Factor kg/day	Oral Bioavailability unitless	Exposure Frequency days/year	Exposure Duration years	Fraction Ingested from Contaminated Source unitless	Averaging Time (non-carcinogens) years	Body Weight kg
Perfluorooctane sulfonate (PFOS)	2.5	5.15E-05	1.86E-05	9.58E-10	1.60E-01	1	210	8	0.1	8	24
Perfluorooctanoic acid (PFOA)	0.078	3.33E-08	1.59E-04	5.30E-12	2.84E-02	1	210	8	0.1	8	24
Perfluorohexane sulfonate (PFHxS)	0.32	6.13E-06	2.00E-05	1.23E-10	1.60E-01	1	210	8	0.1	8	24
Perfluorohexanoic acid (PFHxA)	0.073	0.00E+00	1.00E-01	0.00E+00	0.00E+00	1	210	8	0.1	8	24
Exposure Pathway Specific Hazard Index		**5.77E-05**									

Hazard Index	**2.35E+01**

Exposure Parameters

		Residents that inhabit properties adjacent to the Site (off-site)			
General	**units**	**Adult**	**Reference**	**Child**	**Reference**
Body weight	kg	70	NEPC (2013)	15	NEPC (2013)
Exposure duration	yr	29	NEPC (2013)	6	NEPC (2013)
Averaging time (non-carcinogens)	yr	29	NEPC (2013)	6	NEPC (2013)
Incidental Soil Ingestion					
Daily soil ingestion rate	mg/day	50	NEPC (2013)	100	NEPC (2013)
Exposure frequency for soil ingestion	days/yr	365	NEPC (2013)	365	NEPC (2013)
Dust Inhalation					
Exposure time (outdoor air)	hrs/day	4	NEPC (2013)	4	NEPC (2013)
Exposure time (indoor air)	hrs/day	20	NEPC (2013)	20	NEPC (2013)
Exposure frequency	days/yr	365	NEPC (2013)	365	NEPC (2013)
Particulate emission factor (outdoor air)	m3/kg	2.90E+10	NEPC (2013)	2.90E+10	NEPC (2013)
Indoor Air Dust Factor	m3/kg	2.60E+07	NEPC (2013)	2.60E+07	NEPC (2013)
Lung Retention Factor (dust inhalation)	unitless	0.375	NEPC (2013)	0.375	NEPC (2013)
Ingestion of Home Grown Produce					
Fraction of produce consumed from the site	%	10%	NEPC (2013)	10%	NEPC (2013)
Exposure Frequency	days/year	365	NEPC (2013)	365	NEPC (2013)
Consumptuon Rate - Fruit	kg/day	0.14	NEPC (2013)	0.18	NEPC (2013)
Consumptuon Rate - Green Vegetables	kg/day	0.15	NEPC (2013) assumes 59% of vegetables consumed (260 g/day) are green vegetables	0.055	NEPC (2013) assumes 55% of vegetables consumed (100 g/day) are green vegetables
Consumptuon Rate - Tuber Vegetables	kg/day	0.060	NEPC (2013) assumes 23% of vegetables consumed (260 g/day) are tuber vegetables	0.028	NEPC (2013) assumes 28% of vegetables consumed (100 g/day) are tuber vegetables
Consumptuon Rate - Root Vegetables	kg/day	0.047	NEPC (2013) assumes 18% of vegetables consumed (260 g/day) are root vegetables	0.017	NEPC (2013) assumes 17% of vegetables consumed (100 g/day) are root vegetables

Soil-Fruit Concentration Factor	unit	value	Reference
Perfluorooctane sulfonate (PFOS)	mg-chem/kg-plant per mg-chem/kg-soil	0.02	NSW OEH (2019) - values adopted in the derivation of human health soil screening criteria for PFOS, PFHxS and PFOA.
Perfluorooctanoic acid (PFOA)	mg-chem/kg-plant per mg-chem/kg-soil	0.03	
Perfluorohexane sulfonate (PFHxS)	mg-chem/kg-plant per mg-chem/kg-soil	0.02	
Perfluorohexanoic acid (PFHxA)	mg-chem/kg-plant per mg-chem/kg-soil	0	

Soil-Green Vegetable Concentration Factor	unit	value	Reference
Perfluorooctane sulfonate (PFOS)	mg-chem/kg-plant per mg-chem/kg-soil	0.79	NSW OEH (2019) - values adopted in the derivation of human health soil screening criteria for PFOS, PFHxS and PFOA.
Perfluorooctanoic acid (PFOA)	mg-chem/kg-plant per mg-chem/kg-soil	0.1	
Perfluorohexane sulfonate (PFHxS)	mg-chem/kg-plant per mg-chem/kg-soil	0.79	
Perfluorohexanoic acid (PFHxA)	mg-chem/kg-plant per mg-chem/kg-soil	0	

Soil-Tuber Vegetable Concentration Factor	unit	value	Reference
Perfluorooctane sulfonate (PFOS)	mg-chem/kg-plant per mg-chem/kg-soil	0.2	NSW OEH (2019) - values adopted in the derivation of human health soil screening criteria for PFOS, PFHxS and PFOA.
Perfluorooctanoic acid (PFOA)	mg-chem/kg-plant per mg-chem/kg-soil	0.03	
Perfluorohexane sulfonate (PFHxS)	mg-chem/kg-plant per mg-chem/kg-soil	0.2	
Perfluorohexanoic acid (PFHxA)	mg-chem/kg-plant per mg-chem/kg-soil	0	

Soil-Root Vegetable Concentration Factor	unit	value	Reference
Perfluorooctane sulfonate (PFOS)	mg-chem/kg-plant per mg-chem/kg-soil	0.51	NSW OEH (2019) - values adopted in the derivation of human health soil screening criteria for PFOS, PFHxS and PFOA.
Perfluorooctanoic acid (PFOA)	mg-chem/kg-plant per mg-chem/kg-soil	0.15	
Perfluorohexane sulfonate (PFHxS)	mg-chem/kg-plant per mg-chem/kg-soil	0.51	
Perfluorohexanoic acid (PFHxA)	mg-chem/kg-plant per mg-chem/kg-soil	0	

Risk Characterisation

Residents that inhabit properties adjacent to the Site (off-site)

ADULT

CoPC Incidental Ingestion of Soil	Exposure Point Concentration in Soil mg/kg	Hazard Quotient (HQ) unitless	TDI (Background Adjusted) mg/kg/day	Chronic Daily Intake (non-carcinogens) mg/kg/day	Ingestion Rate mg/day	Oral Bioavailability unitless	Exposure Frequency days/year	Exposure Duration years	Fraction Ingested from Contaminated Source unitless	Averaging Time (non-carcinogens) years	Body Weight kg
Perfluorooctane sulfonate (PFOS)	0.15	5.76E-03	1.86E-05	1.07E-07	50	1	365	29	1	29	70
Perfluorooctanoic acid (PFOA)	0.005	2.24E-05	1.59E-04	3.57E-09	50	1	365	29	1	29	70
Perfluorohexane sulfonate (PFHxS)	0.0087	3.11E-04	2.00E-05	6.21E-09	50	1	365	29	1	29	70
Perfluorohexanoic acid (PFHxA)	0.005	3.57E-08	1.00E-01	3.57E-09	50	1	365	29	1	29	70
Exposure Pathway Specific Hazard Index		**6.09E-03**									

Inhalation of soil derived dust in outdoor air	Exposure Point Concentration in Soil mg/kg	Hazard Quotient (HQ) unitless	RfC (Background Adjusted) mg/m3	Exposure Adjusted Air Concentration mg/m3	Concentration in Air (outdoors) mg/m3	Particulate Emission Factor m3/kg	Lung Retention Factor (RF) unitless	Oral Bioavailability unitless	Exposure Time hours/day	Exposure Frequency days/year	Exposure Duration years	Averaging Time (non-carcinogens) years	Body Weight kg
Perfluorooctane sulfonate (PFOS)	0.15	4.62E-09	7.00E-05	3.23E-13	5.17E-12	2.90E+10	3.75E-01	1	4	365	29	29	70
Perfluorooctanoic acid (PFOA)	0.005	1.92E-11	5.60E-04	1.08E-14	1.72E-13	2.90E+10	3.75E-01	1	4	365	29	29	70
Perfluorohexane sulfonate (PFHxS)	0.0087	2.68E-10	7.00E-05	1.88E-14	3.00E-13	2.90E+10	3.75E-01	1	4	365	29	29	70
Perfluorohexanoic acid (PFHxA)	0.005	3.08E-14	3.50E-01	1.08E-14	1.72E-13	2.90E+10	3.75E-01	1	4	365	29	29	70
Exposure Pathway Specific Hazard Index		**4.91E-09**											

Inhalation of soil derived dust in indoor air	Exposure Point Concentration in Soil mg/kg	Hazard Quotient (HQ) unitless	RfC (Background Adjusted) mg/m3	Exposure Adjusted Air Concentration mg/m3	Concentration in Air (indoors) mg/m3	Particulate Emission Factor m3/kg	Lung Retention Factor (RF) unitless	Oral Bioavailability unitless	Exposure Time hours/day	Exposure Frequency days/year	Exposure Duration years	Averaging Time (non-carcinogens) years	Body Weight kg
Perfluorooctane sulfonate (PFOS)	0.15	2.58E-05	7.00E-05	1.80E-09	5.77E-09	2.60E+07	3.75E-01	1	20	365	29	29	70
Perfluorooctanoic acid (PFOA)	0.005	1.07E-07	5.60E-04	6.01E-11	1.92E-10	2.60E+07	3.75E-01	1	20	365	29	29	70
Perfluorohexane sulfonate (PFHxS)	0.0087	1.49E-06	7.00E-05	1.05E-10	3.35E-10	2.60E+07	3.75E-01	1	20	365	29	29	70
Perfluorohexanoic acid (PFHxA)	0.005	1.72E-10	3.50E-01	6.01E-11	1.92E-10	2.60E+07	3.75E-01	1	20	365	29	29	70
Exposure Pathway Specific Hazard Index		**2.74E-05**											

Ingestion of Home Grown Produce - Fruits and Vegetables	Exposure Point Concentration in Soil mg/kg	Hazard Quotient (HQ) unitless	TDI (Background Adjusted) mg/kg/day	Chronic Daily Intake (non-carcinogens) mg/kg/day	Plant Intake Factor kg/day	Oral Bioavailability unitless	Exposure Frequency days/year	Exposure Duration years	Fraction Ingested from Contaminated Source unitless	Averaging Time (non-carcinogens) years	Body Weight kg
Perfluorooctane sulfonate (PFOS)	0.15	1.84E-06	1.86E-05	3.42E-11	2.40E-02	1	365	29	0.1	29	70
Perfluorooctanoic acid (PFOA)	0.005	1.27E-09	1.59E-04	2.03E-13	1.42E-04	1	365	29	0.1	29	70
Perfluorohexane sulfonate (PFHxS)	0.0087	9.93E-08	2.00E-05	1.99E-12	1.39E-03	1	365	29	0.1	29	70
Perfluorohexanoic acid (PFHxA)	0.005	0.00E+00	1.00E-01	0.00E+00	0.00E+00	1	365	29	0.1	29	70
Exposure Pathway Specific Hazard Index		**1.94E-06**									

Hazard Index		**6.12E-03**

CHILD

CoPC Incidental Ingestion of Soil	Exposure Point Concentration in Soil mg/kg	Hazard Quotient (HQ) unitless	TDI (Background Adjusted) mg/kg/day	Chronic Daily Intake (non-carcinogens) mg/kg/day	Ingestion Rate mg/day	Oral Bioavailability unitless	Exposure Frequency days/year	Exposure Duration years	Fraction Ingested from Contaminated Source unitless	Averaging Time (non-carcinogens) years	Body Weight kg
Perfluorooctane sulfonate (PFOS)	0.15	5.38E-02	1.86E-05	1.00E-06	100	1	365	6	1	6	15
Perfluorooctanoic acid (PFOA)	0.005	2.09E-04	1.59E-04	3.33E-08	100	1	365	6	1	6	15
Perfluorohexane sulfonate (PFHxS)	0.0087	2.90E-03	2.00E-05	5.80E-08	100	1	365	6	1	6	15
Perfluorohexanoic acid (PFHxA)	0.005	3.33E-07	1.00E-01	3.33E-08	100	1	365	6	1	6	15
Exposure Pathway Specific Hazard Index		**5.69E-02**									

Inhalation of soil derived dust in outdoor air	Exposure Point Concentration in Soil mg/kg	Hazard Quotient (HQ) unitless	RfC (Background Adjusted) mg/m3	Exposure Adjusted Air Concentration mg/m3	Concentration in Air (outdoors) mg/m3	Particulate Emission Factor m3/kg	Lung Retention Factor (RF) unitless	Oral Bioavailability unitless	Exposure Time hours/day	Exposure Frequency days/year	Exposure Duration years	Averaging Time (non-carcinogens) years	Body Weight kg
Perfluorooctane sulfonate (PFOS)	0.15	4.62E-09	7.00E-05	3.23E-13	5.17E-12	2.90E+10	3.75E-01	1	4	365	6	6	15
Perfluorooctanoic acid (PFOA)	0.005	1.92E-11	5.60E-04	1.08E-14	1.72E-13	2.90E+10	3.75E-01	1	4	365	6	6	15
Perfluorohexane sulfonate (PFHxS)	0.0087	2.68E-10	7.00E-05	1.88E-14	3.00E-13	2.90E+10	3.75E-01	1	4	365	6	6	15
Perfluorohexanoic acid (PFHxA)	0.005	3.08E-14	3.50E-01	1.08E-14	1.72E-13	2.90E+10	3.75E-01	1	4	365	6	6	15
Exposure Pathway Specific Hazard Index		**4.91E-09**											

Inhalation of soil derived dust in indoor air	Exposure Point Concentration in Soil mg/kg	Hazard Quotient (HQ) unitless	RfC (Background Adjusted) mg/m3	Exposure Adjusted Air Concentration mg/m3	Concentration in Air (indoors) mg/m3	Particulate Emission Factor m3/kg	Lung Retention Factor (RF) unitless	Oral Bioavailability unitless	Exposure Time hours/day	Exposure Frequency days/year	Exposure Duration years	Averaging Time (non-carcinogens) years	Body Weight kg
Perfluorooctane sulfonate (PFOS)	0.15	2.58E-05	7.00E-05	1.80E-09	5.77E-09	2.60E+07	3.75E-01	1	20	365	6	6	15
Perfluorooctanoic acid (PFOA)	0.005	1.07E-07	5.60E-04	6.01E-11	1.92E-10	2.60E+07	3.75E-01	1	20	365	6	6	15
Perfluorohexane sulfonate (PFHxS)	0.0087	1.49E-06	7.00E-05	1.05E-10	3.35E-10	2.60E+07	3.75E-01	1	20	365	6	6	15
Perfluorohexanoic acid (PFHxA)	0.005	1.72E-10	3.50E-01	6.01E-11	1.92E-10	2.60E+07	3.75E-01	1	20	365	6	6	15
Exposure Pathway Specific Hazard Index		**2.74E-05**											

Ingestion of Home Grown Produce - Fruits and Vegetables	Exposure Point Concentration in Soil mg/kg	Hazard Quotient (HQ) unitless	TDI (Background Adjusted) mg/kg/day	Chronic Daily Intake (non-carcinogens) mg/kg/day	Plant Intake Factor kg/day	Oral Bioavailability unitless	Exposure Frequency days/year	Exposure Duration years	Fraction Ingested from Contaminated Source unitless	Averaging Time (non-carcinogens) years	Body Weight kg
Perfluorooctane sulfonate (PFOS)	0.15	8.59E-06	1.86E-05	1.60E-10	2.40E-02	1	365	6	0.1	6	15
Perfluorooctanoic acid (PFOA)	0.005	5.94E-09	1.59E-04	9.45E-13	1.42E-04	1	365	6	0.1	6	15
Perfluorohexane sulfonate (PFHxS)	0.0087	4.63E-07	2.00E-05	9.27E-12	1.39E-03	1	365	6	0.1	6	15
Perfluorohexanoic acid (PFHxA)	0.005	0.00E+00	1.00E-01	0.00E+00	0.00E+00	1	365	6	0.1	6	15
Exposure Pathway Specific Hazard Index		**9.06E-06**									

Hazard Index		**5.69E-02**

nation partners

Exposure Parameters

		Recreational receptors that use Tarro Reserve			
General	**units**	**Adult**	**Reference**	**Child**	**Reference**
Body weight	kg	70	NEPC (2013)	15	NEPC (2013)
Exposure duration	yr	29	NEPC (2013)	6	NEPC (2013)
Averaging time (non-carcinogens)	yr	29	NEPC (2013)	6	NEPC (2013)

Incidental Water Ingestion					
Incidental ingestion rate	L/day	0.05	enHealth (2012) suggest the use of an average incidental water ingestion rate for adults of 25 mL/hr, the adopted ingestion rate assumes receptors will be conducting recreational activities at Tarro Reserve for up to two hours per day	0.1	enHealth (2012) suggest the use of an average incidental water ingestion rate of 50 mL/hr for children the adopted ingestion rate assumes receptors will be conducting recreational activities at Tarro Reserve for up to two hours per day
Exposure frequency for incidental water ingestion	days/yr	52	Professional judgement - assumes recreational receptors will conduct recreational activities at Tarro Reserve one day per week, or two days per week for half a year	52	Professional judgement - assumes recreational receptors will conduct recreational activities at Tarro Reserve one day per week, or two days per week for half a year

Risk Characterisation

Recreational receptors that use Tarro Reserve

ADULT

Incidental Ingestion of Surface Water	Exposure Point Concentration in Water mg/L	Hazard Quotient (HQ) unitless	TDI (Background Adjusted) mg/kg/day	Chronic Daily Intake (non-carcinogens) mg/kg/day	Ingestion Rate L/day	Oral Bioavailability unitless	Exposure Frequency days/year	Exposure Duration years	Fraction Ingested from Contaminated Source unitless	Averaging Time (non-carcinogens) years	Body Weight kg
Perfluorooctane sulfonate (PFOS)	0.0012	6.57E-03	1.86E-05	1.22E-07	0.05	1	52	29	1	29	70
Perfluorooctanoic acid (PFOA)	0.00004	2.56E-05	1.59E-04	4.07E-09	0.05	1	52	29	1	29	70
Perfluorohexane sulfonate (PFHxS)	0.00038	1.93E-03	2.00E-05	3.87E-08	0.05	1	52	29	1	29	70
Perfluorohexanoic acid (PFHxA)	0.00016	1.63E-07	1.00E-01	1.63E-08	0.05	1	52	29	1	29	70
Exposure Pathway Specific Hazard Index		**8.52E-03**									

Hazard Index	
	8.52E-03

CHILD

Incidental Ingestion of Surface Water	Exposure Point Concentration in Water mg/L	Hazard Quotient (HQ) unitless	TDI (Background Adjusted) mg/kg/day	Chronic Daily Intake (non-carcinogens) mg/kg/day	Ingestion Rate mg/day	Oral Bioavailability unitless	Exposure Frequency days/year	Exposure Duration years	Fraction Ingested from Contaminated Source unitless	Averaging Time (non-carcinogens) years	Body Weight kg
Perfluorooctane sulfonate (PFOS)	0.0012	6.13E-02	1.86E-05	1.14E-06	0.1	1	52	6	1	6	15
Perfluorooctanoic acid (PFOA)	0.00004	2.39E-04	1.59E-04	3.80E-08	0.1	1	52	6	1	6	15
Perfluorohexane sulfonate (PFHxS)	0.00038	1.80E-02	2.00E-05	3.61E-07	0.1	1	52	6	1	6	15
Perfluorohexanoic acid (PFHxA)	0.00016	1.52E-06	1.00E-01	1.52E-07	0.1	1	52	6	1	6	15
Exposure Pathway Specific Hazard Index		**7.96E-02**									

Hazard Index	
	7.96E-02

Appendix C – Protected Matter Search Tool Output

Australian Government

Department of the Environment and Energy

EPBC Act Protected Matters Report

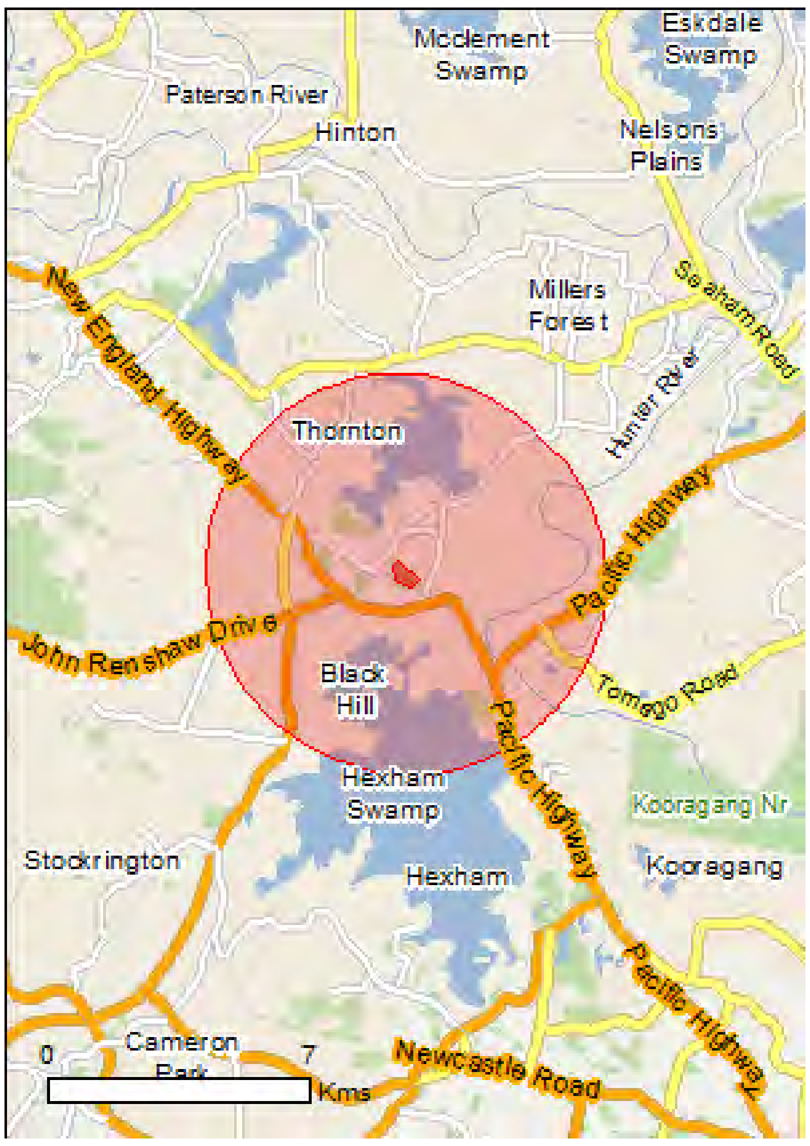
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 04/03/20 12:09:45

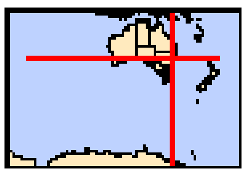
- Summary
- Details
  - Matters of NES
  - Other Matters Protected by the EPBC Act
  - Extra Information
- Caveat
- Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates

Buffer: 5.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	65
Listed Migratory Species:	55

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	3
Commonwealth Heritage Places:	None
Listed Marine Species:	64
Whales and Other Cetaceans:	1
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	2
Regional Forest Agreements:	1
Invasive Species:	45
Nationally Important Wetlands:	3
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Hunter estuary wetlands	Within 10km of Ramsar

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Central Hunter Valley eucalypt forest and woodland	Critically Endangered	Community may occur within area
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community may occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia		
Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris		
Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii		
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus		
Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Dasyornis brachypterus		
Eastern Bristlebird [533]	Endangered	Species or species habitat may occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni		
Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or

Name	Status	Type of Presence
		related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely

Name	Status	Type of Presence
		to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat may occur within area
Fish		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat may occur within area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
Insects		
Synemon plana Golden Sun Moth [25234]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat likely to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat may occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Plants		
Angophora inopina Charmhaven Apple [64832]	Vulnerable	Species or species habitat may occur within area
Caladenia tessellata Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat may occur within area
Commersonia prostrata Dwarf Kerrawang [87152]	Endangered	Species or species habitat likely to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat known to occur within area
Eucalyptus parramattensis subsp. decadens Earp's Gum, Earp's Dirty Gum [56148]	Vulnerable	Species or species habitat likely to occur within area
Grevillea parviflora subsp. parviflora Small-flower Grevillea [64910]	Vulnerable	Species or species habitat likely to occur within area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat may occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat likely to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat may occur within area
Prasophyllum sp. Wybong (C.Phelps ORG 5269) a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
Pterostylis gibbosa Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat may occur within area
Rutidosis heterogama Heath Wrinklewort [13132]	Vulnerable	Species or species habitat likely to occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat likely to occur within area
Tetratheca juncea Black-eyed Susan [21407]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur

Name	Status	Type of Presence
		within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species

[Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna grisea Sooty Shearwater [82651]		Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		

Name	Threatened	Type of Presence
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Director of Defence Service Homes
Commonwealth Land - Director of War Service Homes

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Breeding likely to occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur

Name	Threatened	Type of Presence
		within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Sousa chinensis		
Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Hexham Swamp	NSW
Hunter Wetlands	NSW

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis		
Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis		
Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos		
Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis		
European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata		
Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus		
House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus		
Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern,		Species or species

Name	Status	Type of Presence
Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		habitat likely to occur within area
Asparagus asparagoides		
Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus		
Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Cabomba caroliniana		
Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera		
Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. rotundata		
Bitou Bush [16332]		Species or species habitat likely to occur within area
Cytisus scoparius		
Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Dolichandra unguis-cati		
Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Eichhornia crassipes		
Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista monspessulana		
Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana		
Broom [67538]		Species or species habitat may occur within area
Lantana camara		
Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Opuntia spp.		
Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata		
Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate		
Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla		
Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii		
Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta		
Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis		
Fireweed, Madagascar Ragwort, Madagascar		Species or species

Name	Status	Type of Presence
Groundsel [2624]		habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area

Nationally Important Wetlands

[Resource Information]

Name	State
Hexham Swamp	NSW
Kooragang Nature Reserve	NSW
Shortland Wetlands Centre	NSW

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-32.802513 151.661302,-32.806337 151.666237,-32.807888 151.664477,-32.806373 151.66083,-32.803812 151.660014,-32.802549 151.661302,-32.802513 151.661302

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-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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