Investigation Report

Norfolk Island Fire Station PFAS Assessment

Norfolk Island Regional Council

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1. Introduction

GHD Pty Ltd (GHD) are engaged by the Norfolk Island Regional Council (NIRC) to investigate potential per- and poly-fluoroalkyl substances (PFAS) contamination within the reticulation network of the Norfolk Island Fire Station (NIFS). Following detection of PFAS during annual monitoring conducted by a consultant to the Department of Infrastructure, Transport, Regional Development, Communications and the Arts (DITRCA), GHD completed an on-Island visit in September 2024 to investigate the water reticulation network at the NIFS.

This report has been prepared to summarise the outcomes of the initial investigation.

1.1 Background

The Norfolk Island Fire Station has a history of use of PFAS-containing Aqueous Film Forming Foam (AFFF). In 2019 the DITRCA undertook measures as part of the investigation and subsequent management of PFAS impacts identified on Norfolk Island, including monitoring of the fire station water supply by environmental consultants Senversa Pty Ltd (Senversa) at two tap locations.

In January 2020 Senversa recorded PFAS concentrations (Senversa, 2020) that exceeded the current adopted guidelines for drinking water from the National PFAS National Environmental Management Plan (NEMP) Version 2.0[1] (HEPA, 2020). Annual monitoring conducted by Senversa from 2021 to 2023 recorded PFAS concentrations below the laboratory limit of reporting (LOR). However, during the Senversa June 2024 monitoring event PFAS compounds were detected again. Following PFAS detection at the NIFS, Norfolk Island Regional Council then subsequently conducted their own sampling events during August 2024 at three tap and three above ground tank locations. PFAS compounds were detected at all monitored locations.

GHD Pty Ltd (GHD) was engaged by NIRC to undertake an investigation of the NIFS water supply to facilitate NIRC in making an informed decision on how to manage and remediate the potential contamination risk. GHD prepared an Interim Environmental Advice Letter prior to visiting the Island to provide a preliminary assessment based on the June and August 2024 PFAS results while planning further investigations.

In response to the identified concentrations, GHD conducted an on-Island investigation at the NIFS water supply to identify the source(s) that may be contributing to PFAS concentrations identified within the water at the NIFS tap and above ground tank locations.

1.2 Purpose and objective

The purpose of this investigation was to collect additional samples within the water reticulation network at the fire station with regard to PFAS impact to support NIRC in making informed decisions on remedial or corrective actions related potential contamination in the NIFS water supply. The investigation involves the following objectives:

1. Collect sufficient and quality data on the NIFS water reticulation network to understand the potential extent of PFAS contamination impacting the fire station water supply.
2. Identify potential remedial actions where appropriate to address PFAS contamination impacting on the water usage at the fire station for fire fighting activities and potable uses (where relevant).

1.3 Scope

GHD is undertaking the following tasks to meet the objectives of the investigation:

– Liaise directly with members of NIRC and the NIFS to understand the water reticulation network, the potential contamination pathways and any concerns related to PFAS in the water supply.
– Identify additional sampling locations within the water reticulation network that may be impacted by PFAS through site inspection and observations.
– Collect data (water samples, observations and consultation notes) to support the preliminary conceptual site model.

[1] HEPA. (2020). PFAS National Environmental Management Plan Version 2.0.

– Assess potential PFAS detections within the existing sample locations at NIFS, and any additional locations in the water reticulation network identified to be potentially impacted.
– Analyse the sample data against the adopted human health guidance values to understand if potential remedial actions are required, and provide recommendations for further consideration.

1.4 Limitations

This report has been prepared by GHD for Norfolk Island Regional Council and may only be used and relied on by Norfolk Island Regional Council for the purpose agreed between GHD and Norfolk Island Regional Council as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Norfolk Island Regional Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Investigation Methodology

Previous PFAS sample results collected by Senversa and NIRC were provided to GHD and form the basis of the Interim Advice Letter[2] (provided to NIRC 23rd September 2024) and have directed the preliminary methodology undertaken for this report. The preliminary conceptual site model (CSM) and basis for sampling are provided in the following sections.

2.1 Preliminary conceptual site model

A preliminary CSM for potential PFAS impacted water was developed prior to the on-Island visit with the aim to identify data gaps to be addressed during the investigation. The preliminary CSM is outlined in Table 1 and is based on existing site knowledge and results provided to GHD by NIRC at the beginning of the engagement.

Table 1 Preliminary CSM

PCMS factors	Details
Detected PFAS locations	– Locations that have detected PFAS include the following: • Three above ground water tanks (NIFS_TANK1, NIFS_TANK2 and NIFS_TANK3) • Outside hydrant tap connected to two underground water tanks (NIFS_HYD1). • Kitchen tap connected to building water supply. PFAS was detected 24 hours post-flushing (NIFS_KITCHEN). • Point of use bathroom tap (NIFS_WOMENS TAP).
Contaminants of potential concern (CoPC)	PFAS and PFAS-related substances.
Potential sources	– Upstream/downstream contamination. – Pipework within fire station (residual contamination). – Airport bore water. – Gutter and roof at collection point.
Potential transport pathways	Based on general water use at a fire station is has been assumed: – Firefighting activities in an emergency or during vehicle testing. – Kitchen, bathroom and laundry purposes. – Property and vehicle maintenance.
Potential exposure mechanisms	– Direct exposure of NIFS employees using potentially contaminated water. – Ingestion of contaminated water through potential migration in drinking water. – Vertical and horizontal migrations of contaminants into underlying groundwater and subsequent migration into the wider aquifer. – Surface water runoff and migration into surface water towards Mission Creek. – Direct or indirect uptake by flora and fauna. – Environmental exposure through spraying contaminated water from the fire trucks. Surface water drains under the runway back towards Mission Creek.
Potential sensitive receptors	– NIFS employees. – Surrounding environment.
Potential source-pathway-receptor (SPR) linkages	– Health risks to NIFS employees who may come in contact with or drink impacted water. – Health risks through bioaccumulation and ingestion via the food sources on the island. – Environmental risks to surrounding flora and fauna.

Residual data gaps identified through the preliminary CSM, for further investigation on-Island included:

– The primary source of PFAS detected onsite was unknown. Sources may include:
  • Contaminated water filling the three above ground water tanks and two underground water tanks.

[2] GHD, 12649533-LET_Interim Environmental Advice Letter

- Cross-contamination between contaminated water tanks and building water supply.

– The extent of PFAS contamination in the water supply network at NIFS (if any) was unknown.

2.2 Data quality objectives and indicators

The data quality objective (DQO) process is designed so that information that is reviewed and collected is appropriate and achieves the stated objectives. DQOs have been developed based on guidance presented in the National Environment Protection (Assessment of Site Contamination Measure 1999, as amended 2013 (the ASC NEPM), as summarised in Table 2.

Table 2 Data quality objectives

Step	Description
Step 1: State the problem	The source and extent of PFAS contamination is unclear and whether it poses a potential risk to human health and the environment.
Step 2: Identify the decision	The key decisions to be made are considered to be: – Is there PFAS contamination upstream or downstream of the NIFS water network currently impacted areas (where detections have been identified)? – What is the nature, source and extent of PFAS contamination in the water network? – What is the potential risk posed to human health and environment? – Do remedial actions need to occur?
Step 3: Identify inputs for the decision	The following decision inputs are needed to allow a sound scientific evaluation of the questions stated above: – Collection and analysis of representative water samples to provide a valid data set upon which to base subsequent decisions. – Comparison of the analytical data to applicable guidelines protective of human health and the environment to evaluate the potential for contamination (if identified) to pose a risk of harm. – An assessment of the quality (including consideration of quality assurance and quality control data) of analytical data and field protocol to determine the reliability of data.
Step 4: Define the study boundaries	The study area is defined in Figure 1 and includes the immediate extent of the water network that feeds NIFS. The timeframe of the study is restricted by available time on-Island and the program agreed with NIRC. The investigation will commence at the arrival on-Island for collection of samples, and end with the departure off-Island with follow-up reporting. The CoPC being studied is PFAS.
Step 5: Develop a decision rule	The decisions associated with accepting data in relation to its suitability for use in our assessment were considered with reference to relevant environmental guidelines and regulations (e.g. NEMP v2.0). The key decision rules adopted are: – If concentrations of contaminants are identified and are below the adopted investigation levels, and the data is of acceptable quality, then an unacceptable risk to human health or the environment is unlikely. – If concentrations of contaminants are identified above the adopted investigation levels, and the data is of acceptable quality, then there may be a potential risk to human health or the environment and further investigation, assessment and/or management may be required.
Step 6: Specify limits on decision error	Two primary decision error-types may occur due to uncertainties or limitations in the investigation data: – A sample may be deemed to pass the nominated criteria, when in fact it does not. This may occur if contamination is 'missed' due to limitations in the sampling plan, or if the project analytical data set is unreliable. – A sample/area may be deemed to fail the nominated criteria, when in fact it does not. This may occur if the project analytical data set is unreliable, due to inappropriate sampling, sample handling, or analytical procedures. To minimise the potential for the decision errors above, an assessment is required as to the likelihood of a decision error being made based on the results of a quality assurance/quality control (QA/QC) assessment, and the closeness of the data to assessment criteria. Additionally,

Step	Description
	statistical methods may be used, where applicable, such as 95% Upper Confidence Limit calculations. The QA/QC assessment uses data quality indicators (DQIs) for completeness, comparability, representativeness, precision and accuracy. The DQIs for sampling techniques and laboratory analysis of collected samples identifies the acceptable level of error for this investigation. The data quality objectives are assessed by reference to data quality indicators as follows: **Data Representativeness** - expresses the degree which sample data accurately and precisely represents a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples in an appropriate pattern across the site, and by using an adequate number of sample locations to characterise the site. Consistent and repeatable sampling techniques and methods are utilised throughout the sampling. **Completeness** - defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study. If there is insufficient valid data, then additional data are required to be collected. Additionally, appropriate practical quantification limits (PQL) for the laboratory analysis are required. **Comparability** - is a qualitative parameter expressing the confidence with which one data set can be compared with the other. This is achieved through maintaining a level of consistency in techniques used to collect samples and ensuring analysing laboratories use consistent analysis techniques and reporting methods. **Precision** - measures the reproducibility of measurements under a given set of conditions. The precision of the data is assessed by calculating the Relative Percent Difference (RPD) between duplicate sample pairs. $$RPD(\%) = \frac{|C_o - C_d|}{C_o + C_d} \times 200$$ Where Co = Analyte concentration of the original sample Cd = Analyte concentration of the duplicate sample GHD adopts a nominal acceptance criterion of ± 30% RPD for field duplicates and splits for inorganics and a nominal acceptance criterion of ± 50% RPD for field duplicates and splits for organics. However, it is noted that this will not always be achieved, particularly at low analyte concentrations. **Accuracy** - measures the bias in a measurement system. Accuracy can be undermined by such factors as field contamination of samples, poor preservation of samples, poor sample preparation techniques and poor selection of analytical techniques by the analysing laboratory. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes, laboratory blanks and analyses against reference standards. The nominal "acceptance limits" on laboratory control samples are defined as follows: **Laboratory duplicates** – If the contaminant concentration is less than 10 times the Estimated Quantitation Limit (EQL) or Practical Quantitation Limit (PQL) then no RPD limit applies. If the concentration is greater than 10 times the EQL or PQL than an RPD limit of 30% applies, meaning that if results show greater than 30% difference, a review should be conducted of the cause (e.g. instrument calibration, extraction efficiency, appropriateness of the method used, etc.). It is noted that higher variations can be expected for organic analyses compared to inorganic analyses, and for samples with low analyte concentrations or non-homogeneous samples and the RPD is a guideline rather than a strict limit of compliance. **Laboratory surrogates** (Organics only) – 60 - 140% recovery. **Laboratory blanks** - <PQL.
Step 7: Optimise the design for obtaining data	The sample design will be optimised through: – Engagement with key stakeholders for secondary data collection throughout the study. – Flexibility for in-field decision making by appropriately qualified personnel to enhance data collection and/or efficiency. – All samples will be analysed by National Association of Testing Authorities (NATA) accredited analysis methodologies and QA/QC procedures. – Evaluation and interpretation of results with respect to relevant and current guidelines.

2.3 On-Island activities

GHD visited Norfolk Island on 25th to 27th September 2024 to conduct the on-Island investigation. The key activities undertaken on site are summarised in Table 3.

Table 3 On-Island activities completed by GHD

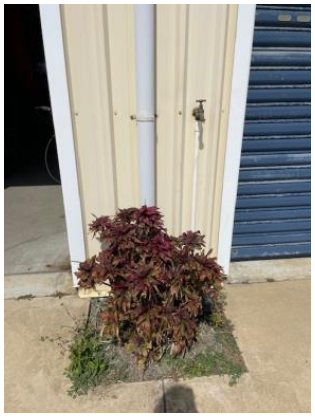
Dates	Key activities
25 September 2024	– Meeting conducted with NIRC and NIFS participants (held at NIFS) to discuss the draft interim advice letter and the activities associated with the investigation. – Site walkover with the NIFS firefighters and various discussions to record detail of the potential contamination source(s), mapping of the water supply network, and to determine appropriate sampling locations. – Sampling and taking photographs of agreed sample locations. Photos are provided in Table 4.
26 September 2024	– Sampling of the identified locations across NIFS and the wastewater treatment system supply at the airport. – Further consultation with the NIFS firefighters to record additional detail on the water supply usage and extent, and provide environmental education where relevant to the investigation.
27 September 2024	– Meeting with NIRC and NIFS to discuss outcomes and next steps. – Additional samples taken where agreed at the above meeting. – Samples packaged and consigned with the on-Island courier to be sent to the laboratory.

2.4 Sampling locations

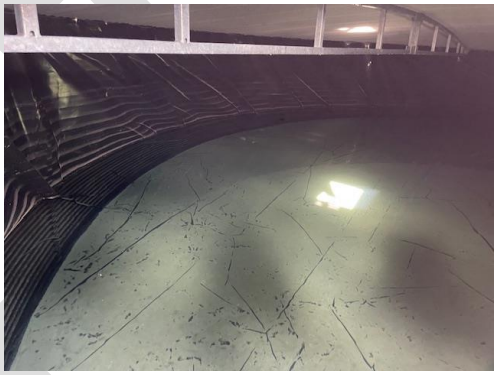
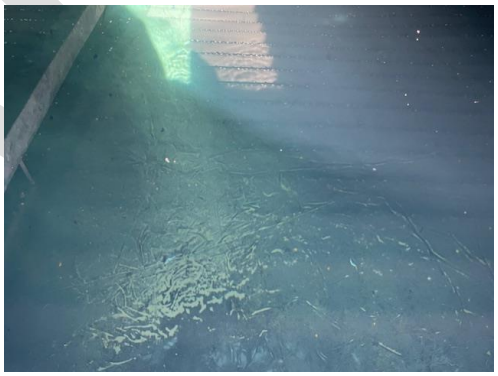
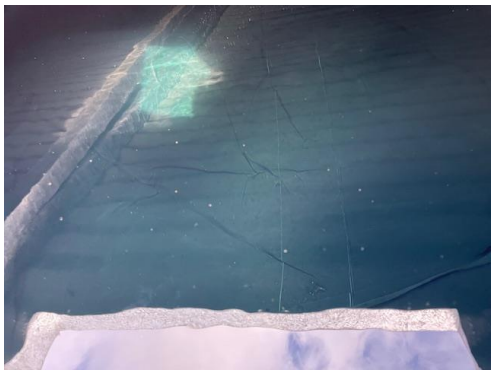
Sample locations were determined through consultation and discussions around the water network while on site. Sample locations are summarised in Table 4 and Figure 1.

Table 4 Sample locations on 26-27 September 2024

Location name	Purpose and rationale	Photograph
NIFS HYD 1	Outside hydrant no. 1, connected to underground water tanks storage used to fill the NIFS fire trucks. This location was previously referred to as 'FRE_TAP2'.	
NIFS WOMENS TAP	The bathroom tap in the women's bathroom was sampled prior to flushing (first supply) to identify any potential residual PFAS contamination within the plumbing. It is understood that the plumbing in the women's bathroom tap has not been replaced. This location was previously referred to as 'FIRIES-POU-BATH'.	
NIFS WOMENS FLUSH	The bathroom tap in the women's bathroom was sampled after flushing to identify any potential contamination from the water supply.	

Location name	Purpose and rationale	Photograph
NIFS KITCHEN	The kitchen tap was previously connected to the rainwater Tank 1. The plumbing in the kitchen was replaced following the detections in June, and is now connected to a black poly tank containing desalination water delivered to the station (interim solution). The kitchen tap is understood to not be used for drinking, however used for washing hands and washing up dishes. This location was previously referred to as 'FRE_TAP1' and 'FIRIES-FLUSH1-TAP1'.	No photographs taken.
NIFS BA ROOM	The BA room sample was taken from the sink tap where the NIFS firefighters would generally clean their equipment (currently not in use as an interim measure). It is understood that the plumbing to this sink has not been replaced.	
NIFS EMNI KITCHEN	The kitchen on the second floor of the fire station, generally accessed separately on a semi-regular basis for search and rescue training by the police force or other associated members (currently not in use as an interim measure). It is understood that the plumbing to this sink has not been replaced.	
NIFS GARDEN TAP	The garden tap sampled is located between the rolling doors at the NIFS (not airside). The plumbing to this tap is understood to not have been replaced.	

Location name	Purpose and rationale	Photograph
NIFS GUTTER	The gutter that collects rainwater from the roof of the fire station was sampled prior to entering the gutter pipe. This sample location was identified at the first entry point for the water reticulation network associated with Tank 1 and the internal plumbing of the station (prior to switching to the interim solution).	
NIFS LAUNDRY	The laundry plumbing was replaced by NIRC in 2024 following the PFAS detections in June. This sample was collected from the laundry tap as a point of use by the NIFS firefighters (currently not in use while under investigation).	
NIFS POLY GREEN	The green poly tank located at the fire station has been provided by NIRC as a temporary solution of desalination water while investigation and potential remedial action is completed. Based on request from the NIFS firefighters (as agreed with NIRC), a sample from the poly tank was taken from the top hatch.	
NIFS PVC TANK1 INLET	The PVC pipe running from the gutter, underground to Tank 1 was sampled at the point of entry to Tank 1 to identify any potential detections of PFAS between the rainwater entry to the gutter, and the Tank 1 inlet.	

Location name	Purpose and rationale	Photograph
NIFS TANK1	Tank 1 is a rainwater tank closest to the fire station, and was accessible for sampling at both the top hatch, and a bottom elbow joint. This sample was taken from the elbow joint at the bottom of the tank. This location was previously referred to as 'FIRIES-TANK1'.	
NIFS TANK1 TOP	Tank 1 is a rainwater tank closest to the fire station, and was accessible for sampling at both the top hatch, and a bottom elbow joint. This sample was taken from the top hatch.	
NIFS TANK2	Above ground water tank in the middle, taken from the top hatch. The tank was previously installed for the AFFF transition work undertaken in 2020 by DITRCA and utilised for treated flush water. This location was previously referred to as 'FIRIES-TANK2'.	
NIFS TANK3	Above ground water tank closest to the town, taken from the top hatch. The tank was previously installed for the AFFF transition work undertaken in 2020 by DITRCA and utilised for raw flush water. This location was previously referred to as 'FIRIES-TANK3'.	

Location name	Purpose and rationale	Photograph
POET POLY TREATED	Point of entry treatment (POET) plant that historically fed (and in future may feed) the NIFS underground tanks and hydrants. This tank also feeds the overhead fill point at the airport bore area that (based on on-Island consultation) water trucks utilise on-Island to fill toilets and for construction water (dust suppression).	
CONCRETE BORE	Concrete above ground tank at the airport bore, containing airport bore water. This bore and tank has historically contained PFAS and is raw water prior to PFAS treatment. The tank feeds into the POET system for treatment.	

The location of the sample points is presented in Figure 1 and Figure 2 located in Section 6.

2.5 Sampling methodology

Water samples were collected on the 26th and 27th of September by a GHD Senior Environmental Scientist from the locations listed in Section 2.4. Sample points were flushed for > 30 seconds to collect a representative sample without residual impact from stagnant water within the sample point. The samples were collected wearing nitrile gloves and placed directly into laboratory supplied bottles, which were then placed in an ice filled esky.

2.6 Laboratory analysis

All water samples were analyses for PFAS (standard limit of detection) analysis.

Samples were consigned to the following primary and secondary National Association of Testing Authorities (NATA) accredited analytical laboratories:

– Primary laboratory: ALS Environmental
– Secondary laboratory: Eurofins MGT

Samples were transported in an esky under full chain of custody documentation for liquid chromatography/tandem mass spectrometry (LC-MS/MS) analysis.

Laboratory reports are provided in Appendix C. Results and quality assurance and quality control are discussed in Section 4.

2.7 Quality assurance and quality control

Quality assurance (QA) and quality control (QC) samples were collected on a random basis from one of the sample locations.

Duplicate and triplicate sampling was undertaken to assess the integrity of sampling, transportation and testing procedures. Field and laboratory QAQC results are discussed further in Section 4.1.

2.8 Adopted guidelines

Health guidance values from the PFAS NEMP Version 2.0[3] were considered in the reporting of analytical results. The NEMP 2.0 recognises that PFOS, PFOA and PFHxS are primary indicators of the presence of PFAS compounds and have adopted guideline values for these compounds, as summarised in Table 5.

The comparisons include human health criteria for drinking and recreational water (which have been developed with reference to the National Medical Research Council (NHMRC) guidance values[4]).

To support the future-proofing of guideline comparisons, we have reviewed the draft NEMP Version 3.0[5] human health guidelines. These guidelines share the same adopted guidance values as the current version. However, the National Health, Medical and Research Centre (NHMRC) recently released draft updated guidance values for drinking water[6]. The adopted criteria and additional draft criteria are outlined in Table 5.

Table 5 Adopted criteria for the investigation

Adopted criteria for water	PFOS + PFHxS	PFOA	PFOS	PFHxS	PFBS
NEMP 2.0 Drinking water guidance value	0.07 µg/L	0.56 µg/L			
NEMP 2.0 Recreational water guidance value	2 µg/L	10 µg/L			
NEMP 2.0 95% protection level for marine and freshwater environments	0.13 µg/L	220 µg/L			
NHMRC ADWG - Draft Guidance for PFAS		0.2 µg/L	0.004 µg/L	0.03 µg/L	1 µg/L

The adopted guidelines are presented together with the analytical data in the results tables provided in Appendix A.

[3] HEPA. (2020). PFAS National Environmental Management Plan Version 2.0.
[4] Natural Resource Management Ministerial Council (NRMMC), Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy, NHMRC, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra, 2011 and Guidance on PFAS in Recreational Water, Canberra, NHMRC, 2019
[5] Draft PFAS National Environmental Management Plan, Version 3.0, Heads of EPAs (HEPA) Australia and New Zealand and the Australian Government Department of the Environment and Energy (DoEE), 2022
[6] Draft fact sheet on PFAS (Public Consultation draft October 2024), NHMRC, 2024

3. Site observations

3.1 Water supply observations

The information collected during the visit is summarised below to provide additional context when considering the results of the sampling event.

Potential contamination sources

– Since the fire truck transition program undertaken at the station in 2022, Tank 3 (raw flush water from the transition) was re-lined. Tank 2 containing treated POET water did not have the liner replaced following the transition program.
– It was noted that the understanding from the NIFS firefighters involves Tanks 1, 2 and 3 being connected during ~February 2024, by other parties, with the intent of maximising the rainwater infrastructure capacity. These have since been disconnected.
– The fire station was plumbed to Tank 1 (originally rainwater only), which contained a water mixture when Tank 1, 2 and 3 were connected in early 2024.
– It was noted that Tank 2 contained treated POET plant water (unknown treatment quality).
– NIFS firefighters indicated that dust was significant in the air in ~July/August 2024 lasting for one month during road works outside the fire station. The dust was present surrounding the station during this time. Sedimentation that was observed within the above ground tanks may have been impacted by this dust.

Supply network changes since annual sampling identified concentrations

– It is understood that following the detection of PFAS in June and August 2024, NIRC has been providing an interim solution involving desalination water delivery on a regular basis to the NIFS, stored in poly tanks.
– The plumbing associated with the kitchen, showers, and laundry was replaced when the interim water supply was installed.
– Tank 1, 2 and 3 have since been disconnected manually, however a ball valve or similar still exists between the tanks (backflow potential).
– Currently, the BA room, EMNI kitchen tap, and bathroom taps are not in use and signage applied to this effect.
– The water in the kitchen tap is utilised for cleaning purposes however the firefighters noted that the supplied drinking water cooler is utilised for drinking water.

Airport supply network

– It is understood that the underground concrete tanks at the NIFS were resealed prior to 2024 and are currently fed by rainwater (historically fed by POET plant and airport bore). These tanks are utilised for filling the fire trucks from the hydrant only (no potable use).
– The POET system that was installed at the NIFS during the fire truck transition (and treated raw flush water from Tank 3 into storage of Tank 2), was remobilised to the airport bore at the transition program completion.
– The POET system is currently operating to treat raw bore water from the airport bore and treated water stored in a poly tank that feeds the overhead outlet, and has the ability to feed the NIFS underground tanks that supply the hydrants.

3.2 Sampling observations

Observations associated with each sampling location is summarised in Table 6. Photos of each location is provided in the previous Table 4.

Table 6 Sampling location observations

Location name	Field observation
CONCRETE BORE	Water was observed to be light brown and algae or similar present on the top layer. Tank had an exposed area.
NIFS BA ROOM	No visual or olfactory contamination noted. Minor foaming on gloves when sampling.
NIFS EMNI KITCHEN	No visual or olfactory contamination noted.
NIFS GARDEN TAP	No visual or olfactory contamination noted.
NIFS GUTTER	No visual or olfactory contamination noted.
NIFS HYD 1	No visual or olfactory contamination noted.
NIFS KITCHEN	No visual or olfactory contamination noted.
NIFS LAUNDRY	No visual or olfactory contamination noted.
NIFS POLY GREEN	No visual or olfactory contamination noted.
NIFS PVC TANK1 INLET	No visual or olfactory contamination noted. Unable to be flushed.
NIFS TANK1	Sediments observed on the bottom lining. Minor foaming on gloves when sampling.
NIFS TANK1 TOP	Tank was observed with sediment and tap infrastructure (debris) on the bottom lining. Minor foaming on gloves when sampling.
NIFS TANK2	Sediments observed on the bottom lining. Minor foaming on gloves when sampling.
NIFS TANK3	Sediments observed on the bottom lining. Minor foaming on gloves when sampling.
NIFS WOMENS FLUSH	No visual or olfactory contamination noted.
NIFS WOMENS TAP	No visual or olfactory contamination noted.
POET POLY TREATED	No visual or olfactory contamination noted.

4. Results

A summary of the September 2024 PFAS detections relevant at NIFS network and POET network sampling locations (Figure 1 and Figure 2, respectively), compared to adopted health guideline values (Figure 3 and Figure 4, respectively) and key analytical results (Table 7) is provided below. The full chemistry results table and laboratory reports are provided in Appendix A and Appendix C, respectively.

Figure 3 shows that there were no exceedances of the NEMP 2.0 Drinking water guidance values or NHMRC ADWG – Draft Guidance for PFAS values within the NIFS network.

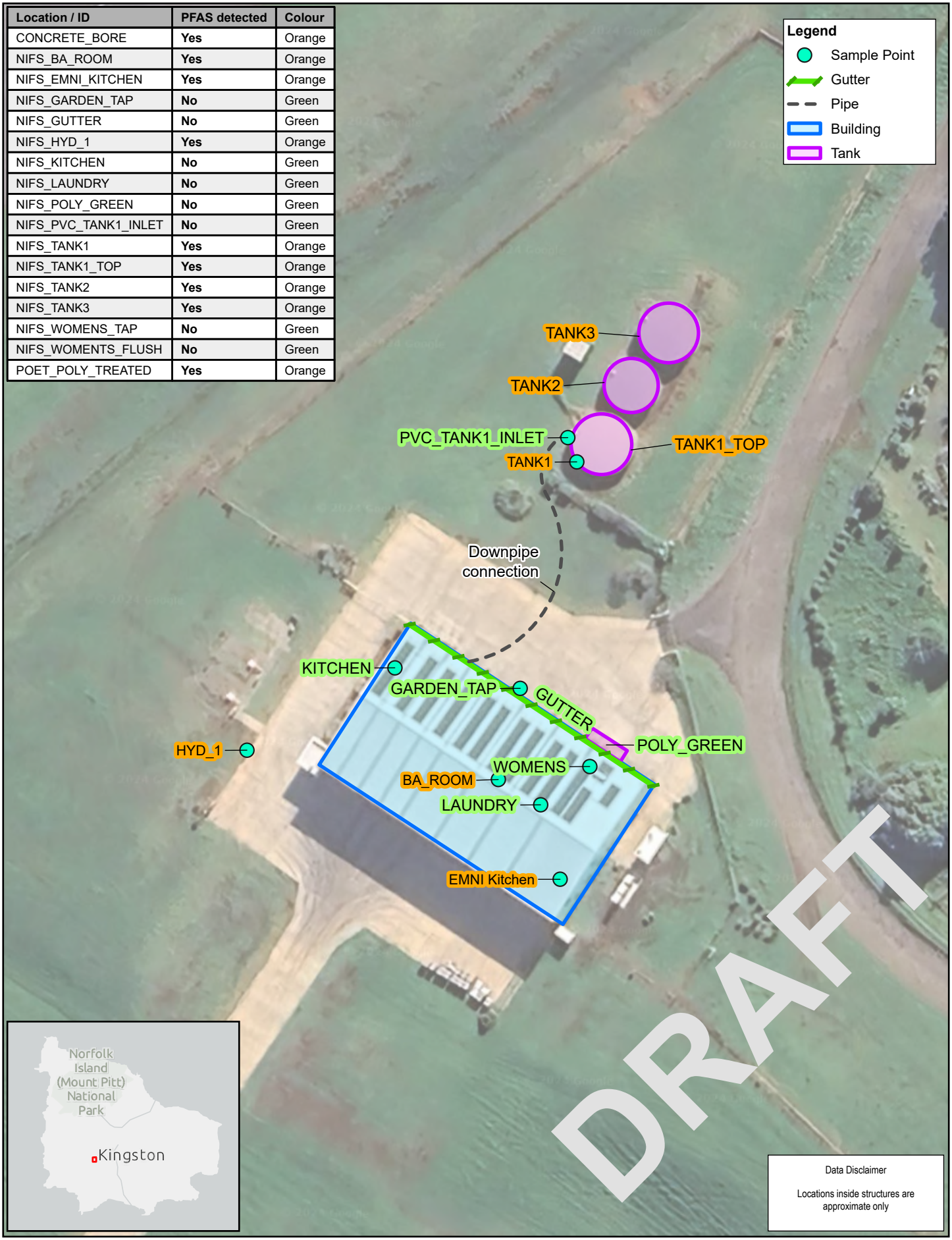
Figure 4 shows that the POET network sampling locations, specifically the untreated and treated water at the airport bore (CONCRETE_BORE and POET_POLY_TREATED) has the highest PFAS detections out of all sampling locations under the investigation. The NEMP 2.0 Drinking water guidance value and NHMRC ADWG - Draft Guidance for PFAS value was exceeded for PFHxS and PFOS (shown as the sum of in the figure for simplicity) at the pre-treatment and post-treatment water tanks and hydrant. The results for the hydrant do not exceed the NEMP 2.0 recreational water guidance values. The NHMRC ADWG - Draft Guidance for PFAS value was also exceeded for PFOA at the pre-treatment concrete tank.

The results highlight varying levels of PFAS detected across different sampling points at the fire station. No PFAS detections were identified at the following sample locations:

– Garden tap (NIFS_GARDEN_TAP)
– Gutter (NIFS_GUTTER)
– Kitchen tap (NIFS_KITCHEN)
– Laundry sink tap (NIFS_LAUNDRY)
– Green poly tank (NIFS_POLY_GREEN)
– PVC pipe inlet at Tank 1 (NIFS_PVC_TANK1_INLET)
– Women’s bathroom sink tap, both before and after flushing (NIFS_WOMENS_TAP).

However, PFAS compounds were detected at all above ground tank sample locations (NIFS_TANK1, NIFS_TANK1_TOP, NIFS_TANK2, NIFS_TANK3), the sink tap in the BA room (NIFS_BA ROOM) and at the kitchen tap in the EMNI kitchen (NIFS_EMNI) on the second floor of the fire station. The PFAS compounds detected in both samples differ. This is further outlined and discussed in Table 7 and Section 6.

Location / ID	PFAS detected	Colour
CONCRETE_BORE	**Yes**	Orange
NIFS_BA_ROOM	**Yes**	Orange
NIFS_EMNI_KITCHEN	**Yes**	Orange
NIFS_GARDEN_TAP	**No**	Green
NIFS_GUTTER	**No**	Green
NIFS_HYD_1	**Yes**	Orange
NIFS_KITCHEN	**No**	Green
NIFS_LAUNDRY	**No**	Green
NIFS_POLY_GREEN	**No**	Green
NIFS_PVC_TANK1_INLET	**No**	Green
NIFS_TANK1	**Yes**	Orange
NIFS_TANK1_TOP	**Yes**	Orange
NIFS_TANK2	**Yes**	Orange
NIFS_TANK3	**Yes**	Orange
NIFS_WOMENS_TAP	**No**	Green
NIFS_WOMENTS_FLUSH	**No**	Green
POET_POLY_TREATED	**Yes**	Orange



Paper Size ISO A4

0 5 10 15 20

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 58

N

GHD

NORFOLK ISLAND REGIONAL COUNCIL
NORFOLK ISLAND FIRE STATION PFAS ASSESSMENT

PFAS ASSESSMENT - FIRE STATION

Project No. **12649533**
Revision No. **C**
Date **28/11/2024**

FIGURE 1

C:\Users\acollins2\OneDrive - GHD\Documents\ArcGIS\Projects\TEMP_Norfolk_Island_PFAS\TEMP_Norfolk_Island_PFAS.aprx
Print date: 28 Nov 2024 - 09:29

Data source: Light Gray Base: Esri, TomTom, Garmin, Foursquare, METI/NASA, USGS
Light Gray Reference: Esri, TomTom, Garmin, Foursquare, METI/NASA, USGS
Google Earth Imagery: © OpenStreetMap (and) contributors, CC-BY-SA. Created by: acollins2

Location / ID	PFAS detected	Colour
CONCRETE_BORE	**Yes**	Orange
POET_POLY_TREATED	**Yes**	Orange

Paper Size ISO A4

0 5

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 58

N

GHD

NORFOLK ISLAND REGIONAL COUNCIL
NORFOLK ISLAND FIRE STATION PFAS ASSESSMENT

PFAS ASSESSMENT
POET TREATMENT SYSTEM

Project No. **12649533**
Revision No. **B**
Date **6/12/2024**

FIGURE 2

\\ghdnet\ghd\AU\Sydney\Projects\41\12649533\GIS\Maps\Working\12649533_Norfolk_Island_PFAS.aprx
Print date: 06 Dec 2024 - 11:13

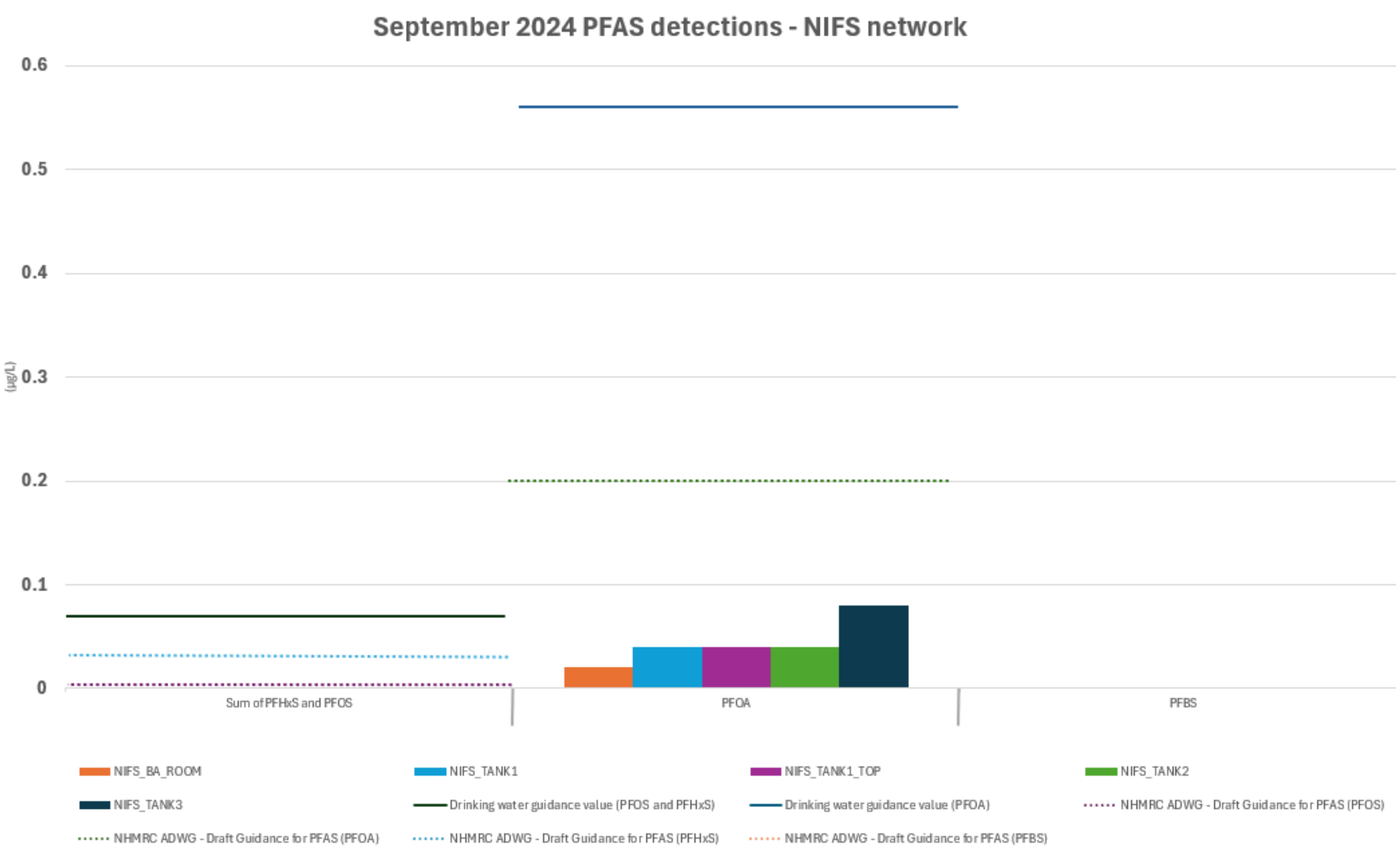


Figure 3 ***September 2024 PFAS detections – - NIFS network - adopted health guidelines***

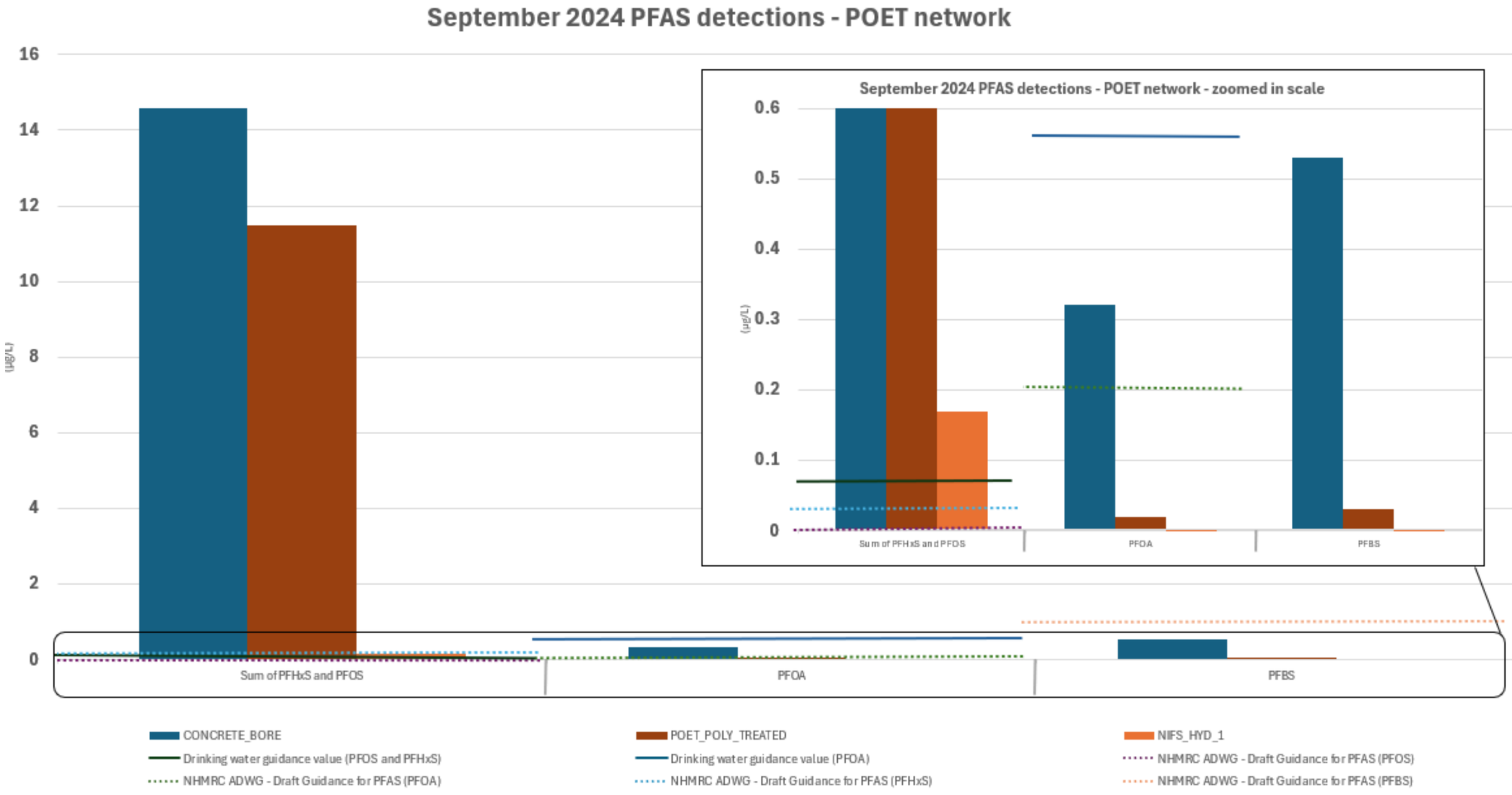


Figure 4 *September 2024 PFAS detections – - POET network - adopted health guidelines*

Table 7 Sample results summary for September 2024

Sample location	PFOS + PFHxS	PFOA	Sum of PFAS	Other PFAS compounds detected
NIFS BA ROOM	<LOR	0.02 µg/L	0.07 µg/L	– PFHpA
NIFS EMNI KITCHEN	<LOR	<LOR	0.07 µg/L	– 8:2 Fluorotelomer sulfonic acid (8:2 FTS)
NIFS HYD 1	0.17 µg/L	<LOR	0.17 µg/L	None
NIFS TANK1	<LOR	0.04 µg/L	0.15 µg/L	– PFHpA – 8:2 FTS
NIFS TANK1 TOP	<LOR	0.04 µg/L	0.22 µg/L	– PFHpA – 8:2 FTS
NIFS TANK2	<LOR	0.04 µg/L	0.75 µg/L	– 8:2 FTS
NIFS TANK3	<LOR	0.08 µg/L	2.56 µg/L	– PFHpA – 8:2 FTS
POET POLY TREATED	11.5 µg/L	0.02 µg/L	11.8 µg/L	– PFBS – PFHpS – PFPeS – PFHxA
CONCRETE BORE	14.6 µg/L	0.32 µg/L	17.7 µg/L	– Perfluorobutane sulfonic acid (PFBS) – Perfluoroheptane sulfonic acid (PFHpS) – Perfluoropentane sulfonic acid (PFPeS) – Perfluoroheptanoic acid (PFHpA) – Perfluorohexanoic acid (PFHxA) – Perfluoropentanoic acid (PFPeA)
NIFS_GARDEN_TAP	< LOR			
NIFS_GUTTER				
NIFS_KITCHEN				
NIFS_LAUNDRY				
NIFS_POLY_GREEN				
NIFS_PVC_TANK1_INLET				
NIFS_WOMENS_FLUSH				
NIFS_WOMENS_TAP				

4.1 Quality assurance and control

The summary of QAQC results is provided in Appendix B and laboratory QAQC results on the certificates of analysis are provided in Appendix C.

5. Updated conceptual site model

The preliminary CSM provided in Section 2.1 has been updated based on the findings from the investigation. The refined conceptual site model is summarised in Table 8.

Table 8 Refined CSM

CSM factors	Details
Detected PFAS locations	Locations that have detected PFAS include the following: – Three above ground water tanks (NIFS TANK1, NIFS TANK1 TOP, NIFS TANK2 and NIFS TANK3). – Outside hydrant connected to the underground concrete water tanks (NIFS_HYD_1). – The kitchen tap on the second floor of the fire station which has not previously been sampled (NIFS EMNI KITCHEN). – The stored bore water feeding the POET plant and the water coming out of the POET plant (CONCRETE_BORE and POET_POLY_TREATED). – The sink tap where the NIFS firefighters would generally clean their equipment which has not previously been sampled (NIFS BA ROOM). The point of use bathroom tap (NIFS WOMENS TAP and NIFS WOMENS FLUSH) did not observe PFAS detections during the September 2024 sample event however has had previous PFAS detections. The kitchen tap on the ground floor (NIFS KITCHEN) did not report PFAS detections during September 2024 sampling period. The plumbing had been replaced. Previous concentrations detected by NIRC/Senversa were recorded prior to the plumbing replacement works. The kitchen tap is now connected to a black poly tank containing desalination water.
Contaminants of potential concern (CoPC)	PFAS and PFAS-related substances.
Potential sources	– Based on stakeholder consultation, it is inferred that above ground Tank 3 had residual PFAS contamination and contained PFAS contaminated water. Above ground Tank 3 was connected to Tank 1 and 2 early in 2024 and is identified as a potential contamination source. – The detected PFAS compounds at the NIFS EMNI kitchen tap may be a result of the plumbing connection to the above ground tanks. – The NIFS BA ROOM and point of use bathroom tap (NIFS WOMENS TAP and NIFS WOMENS FLUSH) is connected to old pipework within the NIFS, therefore contamination could be attributed to residual contamination – The outside hydrant (NIFS_HYD_1) connected to the underground concrete water tanks has historically been fed by treated water coming from the POET plant (POET_POLY_TREATED), which observed detected PFAS concentrations in September 2024. – The samples taken from the gutter collection point did not detect PFAS concentrations, suggesting the rainwater capture point and pathway to Tank 1 is not identified as a source.
Potential transport pathways	Based on consultation with the NIFS firefighters, the following water uses are understood: – Firefighting activities in an emergency or during vehicle testing. – Kitchen, bathroom, laundry and equipment cleaning purposes. – Property and vehicle maintenance.
Potential exposure mechanisms	– Direct exposure of NIFS employees using potentially PFAS impacted water, however it is understood that the above ground tanks, BA ROOM and EMNI kitchen water outlets are currently not in use as an interim measure. – Use of airport bore water (POET_POLY_TREATED) by construction workers and general public leading to direct exposure of potentially PFAS contaminated water and wider environmental exposure if taken and spread off site.
Potential sensitive receptors	– NIFS employees. – Wider NIRC community utilising POET treated water

CSM factors	Details
Potential source-pathway-receptor (SPR) linkages	– Health risks to NIFS employees and wider NIRC community who may come in contact with or drink impacted water. – Health risks through bioaccumulation and ingestion via the food sources on the island. – Environmental risks to surrounding flora and fauna.

6. Discussion

The results of nil detection of PFAS in the samples at the garden tap, kitchen, laundry, gutter, green poly tank, women's bathroom tap, and the PVC pipe inlet at Tank 1 locations indicate that the delivered desalination water and newly installed plumbing are not impacted by PFAS against the current guidance values. The garden tap and women's bathroom are noted to be old plumbing, suggesting limited residual PFAS within the existing pipework at these sample points. In contrast, the BA room identified detections of PFOA and PFHpA which may indicate residual PFAS within the existing pipework.

PFAS detections of 8:2 FtS and PFHpA was observed in all samples taken at the three above-ground tanks (NIFS TANK1, NIFS TANK1 TOP, NIFS TANK2 and NIFS TANK3) outside the fire station. Based on stakeholder engagement discussions, it has been noted that the three tanks were connected in early 2024, allowing mixing of PFAS impacted flush water historically stored in Tank 2 and 3 with water contained within each tank. It is unknown whether historically treated water (from the POET plant) in Tank 2 was impacted by PFAS prior to the three tanks being connected in early 2024. As Tank 1 contained rainwater that was plumbed within the fire station, it is understood that the water mixture from Tanks 1, 2 and 3 then fed the fire station plumbing prior to being disconnected.

The common PFAS compound identified in the samples taken at the above ground tanks is 8:2 FtS, a compound generally associated with firefighting foams with a carbon chain length of 8. This compound detected suggests residual impact from flush water contained within Tank 2 and Tank 3 during the fire truck transition program in 2022, where the vehicle foam tanks were flushed to remove the historic firefighting foam, a C8 product.

The detection of 8:2 FtS at the EMNI kitchen tap (NIFS_EMNI) sample point indicate that the water supply was, or is, connected to the above ground tanks outside the fire station, which samples taken in September 2024 detected concentrations of the same PFAS compound.

Separate to the reticulation network between the above ground tanks and the fire station, further samples were collected from the secondary reticulation network. The samples were collected from the hydrant attached to the underground concrete tanks at the fire station, and the supply source of these, being the pre-treatment (CONCRETE_BORE) and post-treatment (POET_POLY_TREATED) water tanks located at the airport bore.

The PFAS detected in the samples taken at the pre-treatment and post-treatment water locations near the airport bore (CONCRETE_BORE and POET_POLY_TREATED) exceed the human health guidelines, indicating that the POET plant may not be functioning as intended. Based on stakeholder discussions on-Island, the PFAS impacted post-treatment water from the POET plant is connected to the underground concrete tanks at the NIFS, feeding the hydrants (sampled NIFS_HYD_1). The hydrant recorded PFAS concentrations higher than previously recorded during the fire truck transition program, and the September 2024 detected concentrations exceed the human health guidelines. However, concentrations from the hydrant are an order of magnitude less than the treated water from the POET plant. The NIFS firefighters noted that the underground tanks at the fire station have also been topped up with rainwater as needed. It is therefore inferred that PFAS impacted water from the POET plant may have previously mixed with post-treatment POET water contained within the underground tanks.

Two PFAS compounds were detected at the hydrant sample point, being PFOS and PFHxS. The highest PFAS concentrations were detected at concrete tank pre-treatment located at the POET plant (CONCRETE_BORE) and the treated water coming out of the POET plant (POET_POLY_TREATED), with multiple PFAS compounds present, indicating the plant is not performing to its technical specification or expected operational standard.

Based on our findings from this investigation, the following potential PFAS pollutant linkages and potential exposure pathways have been identified at the fire station:

– Above ground Tank 2 and Tank 3. These tanks were connected with Tank 1 in early 2024, with PFAS impacted water stored within the tanks mixed with Tank 1 water (noted by the NIFS firefighters to have been at 90% capacity at the time of connection).
– Tank 1 feeds the NIFS plumbing when connected, therefore the exposure of the fire station plumbing to a PFAS impacted source was identified prior to being disconnected. Currently the fire station is plumbed with an alternative water source from the desalination plant, with PFAS impacts not identified at the green poly tank containing desalination water.
– The pre-treatment and post-treatment water tanks located at the airport bore have been identified as PFAS impacted. These sources have plumbing infrastructure linking them as an exposure pathway to the underground concrete tanks at the fire station. The hydrants connected to these underground tanks are utilised by the NIFS firefighters when undertaking vehicle wet testes regularly. The hydrants and underground tanks are not utilised for potable use. Therefore, drinking water guidance values are not considered required, and PFAS detected at the hydrant do not indicate an exceedance of recreational water quality guidance values.

The DQO process described in Section 2.2 posed questions that were to be resolved regarding the contamination conditions of the site. Our findings in relation to the questions (step 2 of the DQOs) are provided in Table 9.

Table 9 DQO conclusions

Investigation questions	Findings of this investigation
Is there PFAS impact upstream or downstream of the NIFS water network currently impacted areas (where detections have been identified)?	Our assessment has confirmed that there is PFAS impact upstream at the POET plant (CONCRETE_BORE and POET_POLY_TREATED), which feeds the underground tanks and hydrant (NIFS _HYD_1) at the fire station. PFAS concentrations were not detected upstream (NIFS_GUTTER and NIFS_PVC INLET) of the three above ground tanks (NIFS_TANK1, NIFS_TANK2 and NIFS_TANK3), suggesting existing PFAS impacts in the tanks and cross contamination in the tanks. PFAS impacts were detected downstream at various sample points within the fire station, where old plumbing contained potential residual PFAS.
What is the nature, source and extent of PFAS contamination in the water network?	The nature of the contamination is PFAS compounds further described in Section 4 of this report. The contamination is primarily associated with infrastructure that was previously contaminated (three above ground tanks and old plumbing) and impacted treated water from the POET plant. The extent of PFAS impact at the NIFS is currently understood to be the three above ground tanks (NIFS_TANK1, NIFS_TANK2 and NIFS_TANK3), hydrant (NIFS _HYD_1) and underground tanks and within the NIFS building at the sink tap where the NIFS firefighters would generally clean their equipment (NIFS BA ROOM) and upstairs kitchen tap (NIFS EMNI KITCHEN). However, the extent of water used at these locations at the NIFS and the POET plant is unknown.
What is the potential risk posed to human health and environment?	Sample results indicate PFAS detections in the water in the NIFS hydrant (NIFS_HYD_1) and underground tanks, and treated and untreated water at the POET plant (CONCRETE BORE and POET_POLY_TREATED) exceed the adopted human health drinking water guidelines, though not utilised as potable water. The fire station reticulation network sample results did not exceed human health drinking water guidance values.
Do remedial actions need to occur?	Remedial actions and interim actions are discussed in Section 7.

7. Conclusions and Recommendations

The following conclusions and recommendations are provided in Table 10 based on the results discussed above.

Table 10 Conclusions and recommendations

Conclusion	Recommendation
The desalination water delivered to the fire station was sampled and results did not indicate impact from PFAS.	No action This interim measure may therefore be an effective solution while an alternative ongoing potable water source is identified or installed.
The new plumbing at points sampled did not indicate impact from PFAS. PFAS detections were observed in samples related to old plumbing at the BA room tap and EMNI kitchen tap.	It is recommended that old plumbing existing in the fire station that feeds accessible water use points is replaced, to eliminate residual PFAS within the pipework as a source of PFAS concentrations, particularly in the BA room, bathrooms, garden taps and EMNI kitchen. Replacement of the plumbing connected to an unimpacted water supply will facilitate bathroom tap use to be re-instated at the fire station, as well as tap access for equipment cleaning. Based on the PFAS concentrations identified in the investigation and exposure pathways, replacement of sinks or associated infrastructure has not been progressed as a recommendation. Current interim measures including isolation of the impacted sample points is recommended to continue until replacement plumbing and sampling is undertaken.
It is understood that the three above ground tanks previously connected in early 2024 have since been disconnected manually.	It is recommended that any connection valves or infrastructure are removed to eliminate backflow potential or connection access between the tanks.
All three above ground tanks identified PFAS concentrations. Based on stakeholder discussions, the liner of Tank 3 was replaced however effectiveness of this re-lining is unknown due to no sample data available pre- and post- re-lining has been made available.	It is recommended that all three above ground tanks continue to be isolated and not used until potential remedial options or disposal is undertaken.
The sample results from pre and post treatment water sample points at the POET plant indicate that the POET plant is not operating effectively to remove PFAS.	The use of water from the POET should be limited or isolated while further investigation or action is undertaken. The technical specification for the POET plant should be sought from the supplier and reviewed against the existing pre-treatment water source (changed since original installation at the fire station) and the future intended use of the post-treatment water. It is also recommended that other users of the post-treatment water are identified and alternative water sources supplied while investigation and/or action is undertaken to rectify the operation of the POET plant.

Additional proactive recommendations include:

– A possible remedial option includes undertaking a trial to re-line one above ground tank (Tank 1 is connected to unimpacted rainwater infrastructure, so recommended), with continued monitoring prior to potential potable use.
– Where a feasibility options assessment is undertaken, options including tank replacement and/or disposal or tank remediation may be considered dependent on time and cost impacts associated with Island supply chains or mainland requirements.
– Impacted water contained within the above ground tanks at the fire station is recommended for treatment once the POET plant operation is investigated and/or remedied.
– Ongoing monitoring of the NIFS through a Monitoring Plan to facilitate data collection to support triggers for investigation where PFAS detections are observed in future, and facilitate stakeholder management.

Appendices

Appendix A

Results tables

		PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids										
		Perfluorobutane sulfonic acid (PFBS)	Perfluorodecanesulfonic acid (PFDS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorobutanoic acid (PFBA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctanoic acid (PFOA)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)
		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		0.02	0.02	0.02	0.01	0.02	0.01	0.1	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.05	0.02	0.02
NHMRC ADWG - Draft Guidance for PFAS		1			0.004		0.03							0.2				
PFAS NEMP 2.0 2020 Health Drinking Water					0.07		0.07							0.56				
PFAS NEMP 2.0 2020 Recreational Water					2		2							10				
Field ID	**Date**																	
CONCRETE_BORE	26 Sep 2024	0.53	<0.02	0.36	10.5	0.66	4.10	<0.1	<0.02	<0.02	0.14	0.59	<0.02	0.32	0.16	<0.05	<0.02	<0.02
NIFS_BA_ROOM	27 Sep 2024	<0.02	<0.02	<0.02	<0.01	<0.02	<0.01	<0.1	<0.02	<0.02	0.05	<0.02	<0.02	0.02	<0.02	<0.05	<0.02	<0.02
NIFS_EMNI_KITCHEN	27 Sep 2024	<0.02	<0.02	<0.02	<0.01	<0.02	<0.01	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02
NIFS_GARDEN_TAP	27 Sep 2024	<0.02	<0.02	<0.02	<0.01	<0.02	<0.01	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02
NIFS_GUTTER	27 Sep 2024	<0.02	<0.02	<0.02	<0.01	<0.02	<0.01	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02
NIFS_HYD_1	26 Sep 2024	<0.02	<0.02	<0.02	0.11	<0.02	0.06	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02
NIFS_KITCHEN	26 Sep 2024	<0.02	<0.02	<0.02	<0.01	<0.02	<0.01	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02
NIFS_LAUNDRY	26 Sep 2024	<0.02	<0.02	<0.02	<0.01	<0.02	<0.01	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02
NIFS_POLY_GREEN	27 Sep 2024	<0.02	<0.02	<0.02	<0.01	<0.02	<0.01	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02
NIFS_PVC_TANK1_INLET	27 Sep 2024	<0.02	<0.02	<0.02	<0.01	<0.02	<0.01	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02
NIFS_TANK1	26 Sep 2024	<0.02	<0.02	<0.02	<0.01	<0.02	<0.01	<0.1	<0.02	<0.02	0.02	<0.02	<0.02	0.04	<0.02	<0.05	<0.02	<0.02
NIFS_TANK1_TOP	27 Sep 2024	<0.02	<0.02	<0.02	<0.01	<0.02	<0.01	<0.1	<0.02	<0.02	0.02	<0.02	<0.02	0.04	<0.02	<0.05	<0.02	<0.02
NIFS_TANK2	26 Sep 2024	<0.02	<0.02	<0.02	<0.01	<0.02	<0.01	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	<0.02	<0.05	<0.02	<0.02
NIFS_TANK3	26 Sep 2024	<0.02	<0.02	<0.02	<0.01	<0.02	<0.01	<0.1	<0.02	<0.02	0.02	<0.02	<0.02	0.08	<0.02	<0.05	<0.02	<0.02
NIFS_WOMENS_FLUSH	26 Sep 2024	<0.02	<0.02	<0.02	<0.01	<0.02	<0.01	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02
NIFS_WOMENS_TAP	27 Sep 2024	<0.02	<0.02	<0.02	<0.01	<0.02	<0.01	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02
POET_POLY_TREATED	26 Sep 2024	0.03	<0.02	0.16	11.1	0.04	0.36	<0.1	<0.02	<0.02	<0.02	0.03	<0.02	0.02	<0.02	<0.05	<0.02	<0.02
QA1	26 Sep 2024	<0.02	<0.02	<0.02	<0.01	<0.02	<0.01	<0.1	<0.02	<0.02	0.02	<0.02	<0.02	0.04	<0.02	<0.05	<0.02	<0.02
Statistics																		
Number of Results		18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Number of Detects		2	0	2	3	2	3	0	0	0	6	2	0	8	1	0	0	0
Minimum Concentration		<0.02	<0.02	<0.02	<0.01	<0.02	<0.01	<0.1	<0.02	<0.02	0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02
Minimum Detect		0.03	ND	0.16	0.11	0.04	0.06	ND	ND	ND	0.02	0.03	ND	0.02	0.16	ND	ND	ND
Maximum Concentration		0.53	<0.02	0.36	11.1	0.66	4.1	<0.1	<0.02	<0.02	0.14	0.59	<0.02	0.32	0.16	<0.05	<0.02	<0.02
Maximum Detect		0.53	ND	0.36	11.1	0.66	4.1	ND	ND	ND	0.14	0.59	ND	0.32	0.16	ND	ND	ND
Average Concentration *		0.049	0.02	0.047	1.2	0.057	0.26	0.1	0.02	0.02	0.028	0.052	0.02	0.039	0.028	0.05	0.02	0.02
Geometric Average *		0.025	0.02	0.026	0.025	0.025	0.019	0.1	0.02	0.02	0.023	0.025	0.02	0.02	0.022	0.05	0.02	0.02
Median Concentration *		0.02	0.02	0.02	0.01	0.02	0.01	0.1	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.05	0.02	0.02
Standard Deviation *		0.12	0	0.085	3.5	0.15	0.96	0	0	0	0.029	0.13	0	0.073	0.033	0	0	0
Geometric Standard Deviation *		2.2	1	2.3	9.8	2.3	5.1	1	1	1	1.6	2.2	1	2.7	1.6	1	1	1
95% UCL (Student's-t) *		0.0981	0.02	0.0815	2.645	0.118	0.654	0.1	0.02	0.02	0.0401	0.107	0.02	0.0687	0.0413	0.05	0.02	0.02
% of Detects		11	0	11	17	11	17	0	0	0	33	11	0	44	6	0	0	0
% of Non-Detects		89	100	89	83	89	83	100	100	100	67	89	100	56	94	100	100	100

* A Non Detect Multiplier of 1 has been applied.

Environmental Standards

HEPA, Jan 2020, PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems
HEPA, January 2020, PFAS NEMP 2.0 2020 Freshwater - 99% - high conservation value systems
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water
HEPA, January 2020, PFAS NEMP 2.0 2020 Interim marine - 95%-slightly-moderately disturbed system
HEPA, January 2020, PFAS NEMP 2.0 2020 Interim marine - 99% - high conservation value system
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Recreational Water

		PFAS - Perfluoroalkyl Sulfonamide							PFAS - Fluorotelomer Sulfonic Acids				PFAS - Sums		
		N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	Perfluorooctane sulfonamide (FOSA)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)	Sum of PFHxS and 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
EQL		0.05	0.02	0.05	0.05	0.02	0.05	0.02	0.05	0.05	0.05	0.05	0.01	0.01	0.01
NHMRC ADWG - Draft Guidance for PFAS															
PFAS NEMP 2.0 2020 Health Drinking Water															0.07
PFAS NEMP 2.0 2020 Recreational Water															2
Field ID	**Date**														
CONCRETE_BORE	26 Sep 2024	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	17.7	16.3	14.6
NIFS_BA_ROOM	27 Sep 2024	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	0.07	0.07	<0.01
NIFS_EMNI_KITCHEN	27 Sep 2024	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	0.07	0.07	0.07	<0.01
NIFS_GARDEN_TAP	27 Sep 2024	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
NIFS_GUTTER	27 Sep 2024	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
NIFS_HYD_1	26 Sep 2024	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	0.17	0.17	0.17
NIFS_KITCHEN	26 Sep 2024	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
NIFS_LAUNDRY	26 Sep 2024	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
NIFS_POLY_GREEN	27 Sep 2024	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
NIFS_PVC_TANK1_INLET	27 Sep 2024	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
NIFS_TANK1	26 Sep 2024	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	0.09	0.15	0.15	<0.01
NIFS_TANK1_TOP	27 Sep 2024	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	0.16	0.22	0.22	<0.01
NIFS_TANK2	26 Sep 2024	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	0.71	0.75	0.75	<0.01
NIFS_TANK3	26 Sep 2024	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	2.46	2.56	2.56	<0.01
NIFS_WOMENS_FLUSH	26 Sep 2024	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
NIFS_WOMENS_TAP	27 Sep 2024	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
POET_POLY_TREATED	26 Sep 2024	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	11.8	11.5	11.5
QA1	26 Sep 2024	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	0.09	0.15	0.15	<0.01
Statistics															
Number of Results		18	18	18	18	18	18	18	18	18	18	18	18	18	18
Number of Detects		0	0	0	0	0	0	0	0	0	0	6	10	10	3
Minimum Concentration		<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
Minimum Detect		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.07	0.07	0.17
Maximum Concentration		<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	2.46	17.7	16.3	14.6
Maximum Detect		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.46	17.7	16.3	14.6
Average Concentration *		0.05	0.02	0.05	0.05	0.02	0.05	0.02	0.05	0.05	0.05	0.23	1.9	1.8	1.5
Geometric Average *		0.05	0.02	0.05	0.05	0.02	0.05	0.02	0.05	0.05	0.05	0.083	0.09	0.09	0.026
Median Concentration *		0.05	0.02	0.05	0.05	0.02	0.05	0.02	0.05	0.05	0.05	0.05	0.07	0.07	0.01
Standard Deviation *		0	0	0	0	0	0	0	0	0	0	0.58	4.8	4.5	4.2
Geometric Standard Deviation *		1	1	1	1	1	1	1	1	1	1	2.9	12	12	11
95% UCL (Student's-t) *		0.05	0.02	0.05	0.05	0.02	0.05	0.02	0.05	0.05	0.05	0.469	3.854	3.635	3.209
% of Detects		0	0	0	0	0	0	0	0	0	0	33	56	56	17
% of Non-Detects		100	100	100	100	100	100	100	100	100	100	67	44	44	83

* A Non Detect Multiplier of 1 has been applied.

Environmental Standards

HEPA, Jan 2020, PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems
HEPA, January 2020, PFAS NEMP 2.0 2020 Freshwater - 99% - high conservation value systems
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water
HEPA, January 2020, PFAS NEMP 2.0 2020 Interim marine - 95%-slightly-moderately disturbed system
HEPA, January 2020, PFAS NEMP 2.0 2020 Interim marine - 99% - high conservation value system
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Recreational Water

Appendix B

Quality assurance and quality control

Field QAQC

Relative percent differences (RPDs) were calculated for the field duplicate and split pairs, with results presented in Table B - 1. RPD exceedances for the samples are summarised in Table 11. RPD exceedances were not included in the table below if both the primary and duplicate/split concentrations were less than 10 times the LOR.

Table 11 QAQC duplicate and split sample RPD exceedances

QA Sample	Parent sample	Analyte	RPD (%)
QA2	NIFS_TANK1	PFAS (Sum of Total)	40%
		PFAS (Sum of Total)(WA DER List)	100%

We consider that the variability and elevated RPDs in QA2 are unlikely to affect the overall outcome of the assessment, given the general consistency of QA1 and QA3.

Laboratory QAQC

The laboratories carried out internal QC procedures as part of its NATA accreditation, which included analysis of QC samples (duplicates, method blanks, control samples, laboratory-controlled spikes, matrix spikes, and sample surrogates). Laboratory QAQC documentation, including holding time compliance, frequency of QC samples, and QC results are provided in laboratory reports in Appendix C.

A summary of laboratory QAQC is provided in Table 12.

Table 12 Summary of laboratory QAQC compliance

Item	Objective	Summary of results	Compliance
Sample analysis and extraction holding times	Comply with holding times	No holding time outliers	All criteria met
Sample preservation	Samples are collected in appropriately preserved containers	All criteria met	All criteria met
Analysis of laboratory method blanks	No contamination in blanks	No method blank outliers	All criteria met
Analysis of matrix and laboratory control spikes	Test performance of analytical procedures	No laboratory control outliers or matrix spikes outliers	All criteria met
Analysis of laboratory surrogates	No surrogate recovery outliers	No surrogate recovery outliers	All criteria met
Analysis of laboratory duplicates	Frequencies and Relative Percentage Differences (RPDs) within guideline and internal laboratory limits	No laboratory duplicate outliers exist	All criteria met
Analysis of frequency of quality control samples	Actual rate of quality control samples should be greater than or equal to the expected rate.	An outlier exists for laboratory duplicates and matrix spikes for PFAS by LCMSMS.	The laboratory duplicate outliers are not considered to affect the overall results.

The sampling and analysis completed as part of this assessment has been evaluated with consideration of the Data Quality Indicators (DQIs) described in Section 2.2, namely representativeness, completeness, comparability, precision and accuracy. Whilst there were some exceedances of frequency of quality control samples, the overall quality of data is considered to be reasonable and deemed suitable for use in our assessment

Field or Interlab Duplicates

							EB2434020				
Lab Report Number			EB2434020	1145567		EB2434020			EB2434020	1145567	
Field ID			NIFS_HYD_1	QA3		NIFS_TANK1	QA1		NIFS_TANK1	QA2	
Matrix Type			Water	Water		Water	Water		Water	Water	
Date			26 Sep 2024	26 Sep 2024		26 Sep 2024	26 Sep 2024		26 Sep 2024	26 Sep 2024	
Sample Type			Normal	Interlab_D	RPD	Normal	Field_D	RPD	Normal	Interlab_D	RPD
	Unit	EQL									
PFAS - Perfluoroalkyl Sulfonic Acids											
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorononane sulfonate (PFNS)	µg/L	0.01	-	<0.01	-	-	-	-	-	<0.01	-
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	0.11	0.12[#1]	9	<0.01	<0.01	0	<0.01	<0.01	0
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	-	<0.01	-	-	-	-	-	<0.01	-
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	0.06	0.05[#1]	18	<0.01	<0.01	0	<0.01	<0.01	0
PFAS - Perfluoroalkyl Carboxylic Acids											
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	<0.05	0
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.02	<0.01	0	0.02	0.02	0	0.02	0.01[#1]	67
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	<0.02	0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	0	0.04	0.04	0	0.04	0.02[#1]	67
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
PFAS - Perfluoroalkyl Sulfonamide											
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
PFAS - Fluorotelomer Sulfonic Acids											
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.01	0	0.09	0.09	0	0.09	<0.01	160
PFAS - Sums											
PFAS (Sum of Total)	µg/L	0.01	0.17	0.18	6	0.15	0.15	0	0.15	<0.1	**40**
PFAS (Sum of Total)(WA DER List)	µg/L	0.01	0.17	0.18	6	0.15	0.15	0	0.15	<0.05	**100**
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01	-	0.12	-	-	-	-	-	0.02	-
Sum of PFHxS and PFOS	µg/L	0.01	0.17	0.17	0	<0.01	<0.01	0	<0.01	<0.01	0
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01	-	0.17	-	-	-	-	-	0.02	-

Comments
#1 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.

***RPDs have only been considered where a concentration is greater than 10 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: No RPD limit applies (1 - 10 x EQL); 30 (> 10 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**

Field or Interlab Duplicates

							EB2434020				
Lab Report Number			EB2434020	1145567		EB2434020			EB2434020	1145567	
Field ID			NIFS_HYD_1	QA3		NIFS_TANK1	QA1		NIFS_TANK1	QA2	
Matrix Type			Water	Water		Water	Water		Water	Water	
Date			26 Sep 2024	26 Sep 2024		26 Sep 2024	26 Sep 2024		26 Sep 2024	26 Sep 2024	
Sample Type			Normal	Interlab_D	RPD	Normal	Field_D	RPD	Normal	Interlab_D	RPD
	Unit	EQL									
PFAS - Perfluoroalkyl Sulfonic Acids											
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorononane sulfonate (PFNS)	µg/L	0.01	-	<0.01	-	-	-	-	-	<0.01	-
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	0.11	0.12[#1]	9	<0.01	<0.01	0	<0.01	<0.01	0
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	-	<0.01	-	-	-	-	-	<0.01	-
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	0.06	0.05[#1]	18	<0.01	<0.01	0	<0.01	<0.01	0
PFAS - Perfluoroalkyl Carboxylic Acids											
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	<0.05	0
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.02	<0.01	0	0.02	0.02	0	0.02	0.01[#1]	67
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	<0.02	0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	0	0.04	0.04	0	0.04	0.02[#1]	67
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
PFAS - Perfluoroalkyl Sulfonamide											
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
PFAS - Fluorotelomer Sulfonic Acids											
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.01	0	0.09	0.09	0	0.09	<0.01	160
PFAS - Sums											
PFAS (Sum of Total)	µg/L	0.01	0.17	0.18	6	0.15	0.15	0	0.15	<0.1	**40**
PFAS (Sum of Total)(WA DER List)	µg/L	0.01	0.17	0.18	6	0.15	0.15	0	0.15	<0.05	**100**
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01	-	0.12	-	-	-	-	-	0.02	-
Sum of PFHxS and PFOS	µg/L	0.01	0.17	0.17	0	<0.01	<0.01	0	<0.01	<0.01	0
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01	-	0.17	-	-	-	-	-	0.02	-

Comments
#1 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.

***RPDs have only been considered where a concentration is greater than 10 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: No RPD limit applies (1 - 10 x EQL); 30 (> 10 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**

Appendix C

Laboratory reports

CHAIN OF CUSTODY

ALS Use Only

*Mandatory Fields

(Invoicing Office): HD

*PROJECT MANAGER: Liz Kneen

*PM MOBILE: 0437733254

PROJECT NO./PROJECT: 12649533

ALS QUOTE # (Client PL if blank)

SAMPLER: Liz Kneen

SAMPLER MOBILE: "

*INVOICE TO: (client default if nil) liz.kneen@ghd.com

*EMAIL REPORTS TO: (default to PM if blank) "

PURCHASE ORDER NO.:

SITE: Norfolk Island

Page ___of___

CoC #: (if applicable)

* STORAGE REQUIREMENTS
Please check box. →
Standard Storage time from receipt of samples:
Waters - 3 weeks
Soils - 2 months

☑ Standard Storage
☐ Extended Storage
Specify Disposal Date:
Note: Extended storage incurs a fee and requires a signed agreement.

* TURNAROUND
Please check box. →
(Not all tests can be expedited, contact Client Services for more information)

☑ 5+ days (no surcharge)
☐ 3 day (+15%)
☐ 2 day (+30%)
☐ 1 day (+50%)

☑ CC Invoice to PM

*ANALYSIS REQUIRED
(NB. ALS Quote No. and/or Analysis Suite Codes must be listed to attract suite/quoted price)
Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).
Mark an X in the boxes below analysis to indicate the parameter listed above to be tested on that sample.

BIOSECURITY
Country of Origin: (if not Australia)

Comments: Standard LOR

Environmental Division Brisbane
Work Order Reference
EB2434020

Telephone : + 61-7-3552-8685

ALS Use Only Lab ID	Sample ID	Depth	Date/Time	No. Bottles	MATRIX: Soil/Solid(S) Water(W) Sediments (SD), Dust (D), Product (P), Biota (B), Biosolid (BS)	Standard PFAS Suite	Lab QC (additional bottles req.) Dup	Lab QC (additional bottles req.) MS	Additional Information (Comment on hazards - e.g., asbestos, known high contamination)
1	NIFS_KITCHEN		26/09	2	W	X	☐	☐	
2	NIFS_LAUNDRY		26/09			X	☐	☐	
3	NIFS_WOMENS_TAP		27/09			X	☐	☐	
4	NIFS_WOMENS_FLUSH		26/09			X	☐	☐	
5	NIFS_TANK1		26/09			X	☐	☐	
6	NIFS_TANK2		26/09			X	☐	☐	
7	NIFS_TANK3		26/09			X	☐	☐	
8	NIFS_POLY_GREEN		26/09			X	☐	☐	
9	NIFS_HYD_1		27/09			X	☐	☐	
10	POET_POLY_TREATED		26/09			X	☐	☐	
			26/09			X	☐	☐	

Receipt detail (Use Y)

Chilling Method: Ice: Frozen / Melted Ice Bricks: Frozen / Thawed None

Sample Temp at Receipt °C °C °C

Security Seal intact (circle) Yes / No / NA(None)

Carrier Details

Con Note #

☐ Courier/Post ☐ Client

Packaging:

Relinquished by: Liz Kneen

Signature:

Date/Time: 27/09

Received by:

Signature:

Date/

Mandatory Fields

CHAIN OF CUSTODY

Page 2 of 2

CoC #: *(if applicable)*

CLIENT CODE:

*PROJECT MANAGER:

SAMPLER:

*CLIENT:

*PM MOBILE:

SAMPLER MOBILE:

OFFICE: *(Invoiced Office)*

ALS QUOTE # *(Client PL if blank)*

PURCHASE ORDER NO.:

PROJECT NO./PROJECT:

SITE:

*INVOICE TO: *(client default if nil)*

☐ CC Invoice to PM

*EMAIL REPORTS TO: *(default to PM if blank)*

BIOSECURITY

Country of Origin: *(if not Australia)*

*** STORAGE REQUIREMENTS** *Please check box.* →

Standard Storage time from receipt of samples:

Waters - 3 weeks
Soils - 2 months

☒ Standard Storage

☐ Extended Storage

Specify Disposal Date:

Note: Extended storage incurs a fee and requires a signed agreement.

*** TURNAROUND** *Please check box.* →

(Not all tests can be expedited, contact Client Services for more information)

☑ 5+ days (no surcharge)

☐ 3 day (+15%)

☐ 2 day (+30%)

☐ 1 day (+50%)

***ANALYSIS REQUIRED**

(NB. ALS Quote No. and/or Analysis Suite Codes must be listed to attract suite/quoted price)
Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).
Mark an X in the boxes below analysis to indicate the parameter listed above to be tested on that sample.

Comments:

Standard LOR.

WO Sticker to go here.
(ALS use only)

ALS Use Only Lab ID	Sample ID	Depth	Date/Time	No. Bottles	MATRIX: Soil/Solid(S) Water(W) Sediments (SD), Dust (D), Product (P), Biota (B), Biosolid (BS)	Standard PFAS Suite											Lab QC (additional bottles req.) Dup	Lab QC (additional bottles req.) MS	Additional Information (Comment on hazards - e.g., asbestos, known high contamination)
11	CONCRETE_BORE		26/09	2	W	X											☐	☐	
12	QA1		26/09	2	W	X											☒	☐	
/	QA2		26/09	2	W	X											☐	☐	Send to Eurofins
/	QA3		26/09	2	W	X											☒	☐	If spare, send to Eurofins.
13	NIFS_GARDEN_TAP		27/09	2	W	X											☐	☐	
14	NIFS_GUTTER		27/09	2	W	X											☐	☐	
15	NIFS_BA_Room		27/09	2	W	X											☐	☐	
16	NIFS_PVC_TANK1_INLET		27/09	2	W	X											☐	☐	
17	NIFS_TANK1_TOP		27/09	2	W	X											☐	☐	
18	NIFS_EMNI_KITCHEN		27/09	2	W	X											☐	☐	

Receipt Detail (Lab Use ONLY)

Chilling Method: Ice: Frozen / Melted Ice Bricks: Frozen / Thawed None

Sample Temp at Receipt °C °C °C

Security Seal Intact *(circle)* Yes / No / NA(None)

Carrier Details ☐ Courier/Post ☐ Client

Con Note #

Packaging: *(Circle)* Hard Esky Foam Esky Box/Bag/Other

Count # # #

Relinquished by: Liz Kneen Signature: Date/Time: 27/09

Relinquished by: Signature: Date/Time:

Received by: Signature Date/Time:

Received by: Signature Date/Time:

CERTIFICATE OF ANALYSIS

Work Order	: **EB2434020**	Page	: 1 of 11
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: Liz Kneen	Contact	: Nathan King
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61-7-3552-8685
Project	: 12649533	Date Samples Received	: 02-Oct-2024 12:54
Order number	: ----	Date Analysis Commenced	: 08-Oct-2024
C-O-C number	: ----	Issue Date	: 11-Oct-2024 09:20
Sampler	: Liz Kneen		
Site	: NORFOLK ISLAND		
Quote number	: EN/000		
No. of samples received	: 18		
No. of samples analysed	: 18		

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

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

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

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

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

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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

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

- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20mL or 125mL bottles have been tested in accordance with the QSM5.4 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- **PFAS analysis is conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration or as per tables in USEPA 1633 where listed. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS and also conform to QSM 5.4 (US DoD) requirements.

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	Sample ID	NIFS_KITCHEN	NIFS_LAUNDRY	NIFS_WOMENS_TAP	NIFS_WOMENS_FLUSH	NIFS_TANK1
				Sampling date / time	26-Sep-2024 00:00	26-Sep-2024 00:00	27-Sep-2024 00:00	26-Sep-2024 00:00	26-Sep-2024 00:00
					EB2434020-001	EB2434020-002	EB2434020-003	EB2434020-004	EB2434020-005
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**0.02**
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	**0.04**
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	Sample ID	NIFS_KITCHEN	NIFS_LAUNDRY	NIFS_WOMENS_TAP	NIFS_WOMENS_FLUSH	NIFS_TANK1
				Sampling date / time	26-Sep-2024 00:00	26-Sep-2024 00:00	27-Sep-2024 00:00	26-Sep-2024 00:00	26-Sep-2024 00:00
					EB2434020-001	EB2434020-002	EB2434020-003	EB2434020-004	EB2434020-005
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	**0.09**
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	**0.15**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	**0.15**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**105**	**106**	**105**	**103**	**101**
13C8-PFOA	----	0.02	%		**105**	**104**	**106**	**104**	**104**

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	Sample ID	NIFS_TANK2	NIFS_TANK3	NIFS_POLY_GREEN	NIFS_HYD_1	POET_POLY_TREATED
				Sampling date / time	26-Sep-2024 00:00	26-Sep-2024 00:00	27-Sep-2024 00:00	26-Sep-2024 00:00	26-Sep-2024 00:00
					EB2434020-006	EB2434020-007	EB2434020-008	EB2434020-009	EB2434020-010
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**0.03**
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**0.04**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		<0.01	<0.01	<0.01	**0.06**	**0.36**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**0.16**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	**0.11**	**11.1**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**0.03**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	**0.02**	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.04**	**0.08**	<0.01	<0.01	**0.02**
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	NIFS_TANK2	NIFS_TANK3	NIFS_POLY_GREEN	NIFS_HYD_1	POET_POLY_TREATED
				Sampling date / time	26-Sep-2024 00:00	26-Sep-2024 00:00	27-Sep-2024 00:00	26-Sep-2024 00:00	26-Sep-2024 00:00
Compound	CAS Number	LOR	Unit		EB2434020-006	EB2434020-007	EB2434020-008	EB2434020-009	EB2434020-010
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		**0.71**	**2.46**	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**0.75**	**2.56**	<0.01	**0.17**	**11.8**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	**0.17**	**11.5**
Sum of PFAS (WA DER List)	----	0.01	µg/L		**0.75**	**2.56**	<0.01	**0.17**	**11.5**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**99.8**	**110**	**107**	**107**	**106**
13C8-PFOA	----	0.02	%		**104**	**107**	**108**	**106**	**106**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	CONCRETE_BORE	QA1	NIFS_GARDEN_TAP	NIFS_GUTTER	NIFS_BA_ROOM
				Sampling date / time	26-Sep-2024 00:00	26-Sep-2024 00:00	27-Sep-2024 00:00	27-Sep-2024 00:00	27-Sep-2024 00:00
Compound	CAS Number	LOR	Unit		EB2434020-011	EB2434020-012	EB2434020-013	EB2434020-014	EB2434020-015
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		**0.53**	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		**0.66**	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		**4.10**	<0.01	<0.01	<0.01	<0.01
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		**0.36**	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**10.5**	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**0.16**	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.59**	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.14**	**0.02**	<0.02	<0.02	**0.05**
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.32**	**0.04**	<0.01	<0.01	**0.02**
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	CONCRETE_BORE	QA1	NIFS_GARDEN_TAP	NIFS_GUTTER	NIFS_BA_ROOM
				Sampling date / time	26-Sep-2024 00:00	26-Sep-2024 00:00	27-Sep-2024 00:00	27-Sep-2024 00:00	27-Sep-2024 00:00
Compound	CAS Number	LOR	Unit		EB2434020-011	EB2434020-012	EB2434020-013	EB2434020-014	EB2434020-015
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	**0.09**	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**17.7**	**0.15**	<0.01	<0.01	**0.07**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**14.6**	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		**16.3**	**0.15**	<0.01	<0.01	**0.07**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**98.6**	**108**	**106**	**103**	**104**
13C8-PFOA	----	0.02	%		**104**	**105**	**103**	**106**	**103**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	NIFS_PVC_TANK1_INLET	NIFS_TANK1_TOP	NIFS_EMNI_KITCHEN	----	----
				Sampling date / time	27-Sep-2024 00:00	27-Sep-2024 00:00	27-Sep-2024 00:00	----	----
Compound	CAS Number	LOR	Unit		EB2434020-016	EB2434020-017	EB2434020-018	--------	--------
					Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	**0.02**	<0.02	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	**0.04**	<0.01	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	NIFS_PVC_TANK1_INLET	NIFS_TANK1_TOP	NIFS_EMNI_KITCHEN	----	----
				Sampling date / time	27-Sep-2024 00:00	27-Sep-2024 00:00	27-Sep-2024 00:00	----	----
Compound	CAS Number	LOR	Unit		EB2434020-016	EB2434020-017	EB2434020-018	--------	--------
					Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	**0.16**	**0.07**	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	**0.22**	**0.07**	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	**0.22**	**0.07**	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**104**	**105**	**106**	----	----
13C8-PFOA	----	0.02	%		**104**	**106**	**105**	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry / Biology).

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

QUALITY CONTROL REPORT

Work Order	: **EB2434020**	Page	: 1 of 4
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: Liz Kneen	Contact	: Nathan King
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61-7-3552-8685
Project	: 12649533	Date Samples Received	: 02-Oct-2024
Order number	: ----	Date Analysis Commenced	: 08-Oct-2024
C-O-C number	: ----	Issue Date	: 11-Oct-2024
Sampler	: Liz Kneen		
Site	: NORFOLK ISLAND		
Quote number	: EN/000		
No. of samples received	: 18		
No. of samples analysed	: 18		

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

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

- **No Laboratory Duplicate (DUP) Results are required to be reported.**

Method Blank (MB) and Laboratory Control Sample (LCS) Report

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 6100596)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	80.3	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	101	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	0.25 µg/L	87.1	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	95.6	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	84.4	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	77.4	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 6100596)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	83.4	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	90.5	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	85.3	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	87.4	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	87.2	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	85.6	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	85.5	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	93.9	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	93.4	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	84.6	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	75.9	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 6100596)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	98.5	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	80.0	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	79.9	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	87.1	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	90.2	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	98.2	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	103	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 6100596)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 6100596) - continued								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	91.3	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	97.8	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	86.6	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	82.5	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB2434020**	Page	: 1 of 5
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: Liz Kneen	Telephone	: +61-7-3552-8685
Project	: 12649533	Date Samples Received	: 02-Oct-2024
Site	: NORFOLK ISLAND	Issue Date	: 11-Oct-2024
Sampler	: Liz Kneen	No. of samples received	: 18
Order number	: ----	No. of samples analysed	: 18

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)						
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	18	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)						
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	18	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

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

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

Matrix: **WATER**

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

Method / *Container* / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
NIFS_KITCHEN,	NIFS_LAUNDRY,	**26-Sep-2024**	**08-Oct-2024**	25-Mar-2025	✓	**10-Oct-2024**	25-Mar-2025	✓
NIFS_WOMENS_FLUSH,	NIFS_TANK1,							
NIFS_TANK2,	NIFS_TANK3,							
NIFS_HYD_1,	POET_POLY_TREATED,							
CONCRETE_BORE,	QA1							
HDPE (no PTFE) (EP231X)								
NIFS_WOMENS_TAP,	NIFS_POLY_GREEN,	**27-Sep-2024**	**08-Oct-2024**	26-Mar-2025	✓	**10-Oct-2024**	26-Mar-2025	✓
NIFS_GARDEN_TAP,	NIFS_GUTTER,							
NIFS_BA_ROOM,	NIFS_PVC_TANK1_INLET,							
NIFS_TANK1_TOP,	NIFS_EMNI_KITCHEN							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
NIFS_KITCHEN,	NIFS_LAUNDRY,	**26-Sep-2024**	**08-Oct-2024**	25-Mar-2025	✓	**10-Oct-2024**	25-Mar-2025	✓
NIFS_WOMENS_FLUSH,	NIFS_TANK1,							
NIFS_TANK2,	NIFS_TANK3,							
NIFS_HYD_1,	POET_POLY_TREATED,							
CONCRETE_BORE,	QA1							
HDPE (no PTFE) (EP231X)								
NIFS_WOMENS_TAP,	NIFS_POLY_GREEN,	**27-Sep-2024**	**08-Oct-2024**	26-Mar-2025	✓	**10-Oct-2024**	26-Mar-2025	✓
NIFS_GARDEN_TAP,	NIFS_GUTTER,							
NIFS_BA_ROOM,	NIFS_PVC_TANK1_INLET,							
NIFS_TANK1_TOP,	NIFS_EMNI_KITCHEN							

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X) NIFS_KITCHEN, NIFS_LAUNDRY, NIFS_WOMENS_FLUSH, NIFS_TANK1, NIFS_TANK2, NIFS_TANK3, NIFS_HYD_1, POET_POLY_TREATED, CONCRETE_BORE, QA1	**26-Sep-2024**	**08-Oct-2024**	25-Mar-2025	✓	**10-Oct-2024**	25-Mar-2025	✓
HDPE (no PTFE) (EP231X) NIFS_WOMENS_TAP, NIFS_POLY_GREEN, NIFS_GARDEN_TAP, NIFS_GUTTER, NIFS_BA_ROOM, NIFS_PVC_TANK1_INLET, NIFS_TANK1_TOP, NIFS_EMNI_KITCHEN	**27-Sep-2024**	**08-Oct-2024**	26-Mar-2025	✓	**10-Oct-2024**	26-Mar-2025	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X) NIFS_KITCHEN, NIFS_LAUNDRY, NIFS_WOMENS_FLUSH, NIFS_TANK1, NIFS_TANK2, NIFS_TANK3, NIFS_HYD_1, POET_POLY_TREATED, CONCRETE_BORE, QA1	**26-Sep-2024**	**08-Oct-2024**	25-Mar-2025	✓	**10-Oct-2024**	25-Mar-2025	✓
HDPE (no PTFE) (EP231X) NIFS_WOMENS_TAP, NIFS_POLY_GREEN, NIFS_GARDEN_TAP, NIFS_GUTTER, NIFS_BA_ROOM, NIFS_PVC_TANK1_INLET, NIFS_TANK1_TOP, NIFS_EMNI_KITCHEN	**27-Sep-2024**	**08-Oct-2024**	26-Mar-2025	✓	**10-Oct-2024**	26-Mar-2025	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X) NIFS_KITCHEN, NIFS_LAUNDRY, NIFS_WOMENS_FLUSH, NIFS_TANK1, NIFS_TANK2, NIFS_TANK3, NIFS_HYD_1, POET_POLY_TREATED, CONCRETE_BORE, QA1	**26-Sep-2024**	**08-Oct-2024**	25-Mar-2025	✓	**10-Oct-2024**	25-Mar-2025	✓
HDPE (no PTFE) (EP231X) NIFS_WOMENS_TAP, NIFS_POLY_GREEN, NIFS_GARDEN_TAP, NIFS_GUTTER, NIFS_BA_ROOM, NIFS_PVC_TANK1_INLET, NIFS_TANK1_TOP, NIFS_EMNI_KITCHEN	**27-Sep-2024**	**08-Oct-2024**	26-Mar-2025	✓	**10-Oct-2024**	26-Mar-2025	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	18	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	18	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.4, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

Mandatory Fields

CHAIN OF CUSTODY

Page 2 of 2

CoC #: (if applicable)

CLIENT CODE:

*PROJECT MANAGER: Liz Kneen

SAMPLER: Liz Kneen

*CLIENT: GHD

*PM MOBILE: 0437733254

SAMPLER MOBILE: "

OFFICE: (Invoiced Office)

ALS QUOTE # (Client PL if blank)

PURCHASE ORDER NO.:

PROJECT NO./PROJECT: 12649533

SITE: Norfolk Island

*INVOICE TO: (client default if nil) liz.kneen@ghd.com

☑ CC Invoice to PM

*EMAIL REPORTS TO: (default to PM if blank) "

BIOSECURITY

Country of Origin: (if not Australia)

*** STORAGE REQUIREMENTS** Please check box. →

- ☑ Standard Storage
- ☐ Extended Storage

Standard Storage time from receipt of samples:

Waters - 3 weeks
Soils - 2 months

Specify Disposal Date:

Note: Extended storage incurs a fee and requires a signed agreement.

*** TURNAROUND** Please check box. →

(Not all tests can be expedited, contact Client Services for more information)

- ☑ 5+ days (no surcharge)
- ☐ 3 day (+15%)
- ☐ 2 day (+30%)
- ☐ 1 day (+50%)

***ANALYSIS REQUIRED**

(NB. ALS Quote No. and/or Analysis Suite Codes must be listed to attract suite/quoted price)

Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).

Mark an X in the boxes below analysis to indicate the parameter listed above to be tested on that sample.

Standard PFAS Suite

1145567

WO Sticker to go here. (ALS use only)

Comments: Standard LOR.

ALS Use Only Lab ID	Sample ID	Depth	Date/Time	No. Bottles	MATRIX: Soil/Solid(S) Water(W) Sediments (SD), Dust (D), Product (P), Biota (B), Biosolid (BS)	Standard PFAS Suite	Lab QC (additional bottles req.) Dup	Lab QC (additional bottles req.) MS	Additional Information (Comment on hazards - e.g., asbestos, known high contamination)
11	CONCRETE_BORE		26/09	2	W	X	☐	☐	
12	QA1		26/09	2	W	X	☒	☐	
/	QA2		26/09	2	W	X	☐	☐	Send to Eurofins
/	QA3		26/09	2	W	X	☒	☐	If spare, send to Eurofins.
13	NIFS_GARDEN_TAP		27/09	2	W	X	☐	☐	
14	NIFS_GUTTER		27/09	2	W	X	☐	☐	
15	NIFS_BA_ROOM		27/09	2	W	X	☐	☐	
16	NIFS_PVC_TANK1_INLET		27/09	2	W	X	☐	☐	
17	NIFS_TANK1_TOP		27/09	2	W	X	☐	☐	
18	NIFS_EMNI_KITCHEN		27/09	2	W	X	☐	☐	

Receipt Detail (Lab Use ONLY) Chilling Method: Ice: Frozen / Melted Ice Bricks: Frozen / Thawed None

Sample Temp at Receipt °C °C °C

Security Seal Intact (circle) Yes / No / NA(None)

Carrier Details ☐ Courier/Post ☐ Client

Con Note #

Packaging: (Circle) Hard Esky Foam Esky Box/Bag/Other

Count # # #

Relinquished by: Liz Kneen Signature: Date/Time: 27/09

Relinquished by: LP Signature: Date/Time: 3/10/24

Received by: Elena Hayes Signature: Date/Time: 03/10/24 3:35pm

Received by: T=10.3°C (Y) Signature: Date/Time:

Australian Government
Department of Agriculture, Fisheries and Forestry
ABN 34 190 894 983

Entry Finalised To Remain Under Biosecurity Control

AE9HARNKY
AE9HARNKY

To the Importer or any person having possession or custody of the Goods

Legal Notes: A contravention of this direction constitutes a contravention of the *Biosecurity Act 2015*.
The goods (lines) identified below are still under Biosecurity control but the entry has been finalised.
The goods must not be moved, dealt with or interfered with unless otherwise stated in this direction.
Where movement is required to carry out the Biosecurity Activity, the goods must be moved directly to the required location (*Biosecurity Act 2015*).
This copy is to accompany the goods to the destination indicated.
All times stated on this document are in Australian Eastern Standard Time

Brokerage Name:	OPTIM FORWARDING SERVICES PTY. LTD	**Importer Name:**	ALS PTY LTD
Brokerage Branch:	OPTIM FORWARDING SERVICES PTY. LTD - NSW	**Importer Branch Name:**	None
Brokers Reference:	20241002		
Container Numbers:	None		
Commercial Bills:	(MAWB:08155031815, HAWB:None)		
Arrival Date:	01 Oct 2024	**Flight No:**	
Airline:			
This notice is given by (Officer Id):	36L6U2KB6BY7F	**Date:**	01 Oct 2024 9:34 AM

Biosecurity Officer appointed under Section 545 of the *Biosecurity Act 2015*

Direction: The goods (lines) listed below must have the following Biosecurity Activity carried out: **Final Directives: Subject to Permit Conditions** in accordance with the *Biosecurity Act 2015*

Lines	Legal Refs	Quantity	Package	Country
1 WATER SAMPLES				NORFOLK ISLAND

Printing Officer Id:	36L6U2KB6BY7F	**Date Of Print:**	01 Oct 2024 9:34 AM

Additional Information: Goods that become subject to Biosecurity control continue to be subject to Biosecurity control until released from Biosecurity control. The importer and/or owner of the goods, subject to Biosecurity control are liable to pay any expenses connected with the examination, transportation, storage, maintenance, treatment, movement, removal, disposal or destruction of the goods. In addition the Master, owner and/or agent of any conveyance under Biosecurity control, or ordered to be treated are liable to pay the cost of piloting or towing the conveyance, removing things from the conveyance and treating the conveyance and goods on the conveyance or removed from it. If at the end of a period for which any goods have been isolated, a Director of Biosecurity is of the opinion that the goods cannot be released without an unacceptable high level of biosecurity risk, he or she may direct that the goods be secured in such a manner and for such further period as stated in the direction. A person is guilty of a criminal offence if he or she contravenes a Biosecurity officer's direction. If goods are moved or otherwise interfered with in contravention of the *Biosecurity Act 2015* they may be taken into control of the Commonwealth. The Commonwealth does not accept liability for damage which may occur as a result of any necessary treatment. If the owner or agent of goods has been notified that treatment may damage the goods, and the owner or agent does not, before the end of 30 days after the day on which the owner or agent receives the notice, give written notice to a Director of Biosecurity stating that they agree to the treatment, the goods may be taken into control of the Commonwealth. A cost recovery charge that is due and payable to the Commonwealth under the Biosecurity Act 2015 may be recovered as a debt due to the Commonwealth by action in a relevant court [section 596].

To query information contained in this document, contact the department on 1800 900 090

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eurofins | Environment Testing

www.eurofins.com.au EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Unit 1,2 Dacre Street	1/21 Smallwood Place	1/2 Frost Drive
Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	NSW 2304
+61 3 8564 5000	+61 3 8564 5000	+61 2 9900 8400	+61 2 6113 8091	T: +61 7 3902 4600	+61 2 4968 8448
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794 & 2780	Site# 25079

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46-48 Banksia Road
Welshpool
WA 6106
+61 8 6253 4444
NATA# 2377
Site# 2370 & 2554

Eurofins Environment Testing NZ Ltd

NZBN: 9429046024954

Auckland	Auckland (Focus)	Christchurch	Tauranga
35 O'Rorke Road	Unit C1/4 Pacific Rise,	43 Detroit Drive	1277 Cameron Road,
Penrose,	Mount Wellington,	Rolleston,	Gate Pa,
Auckland 1061	Auckland 1061	Christchurch 7675	Tauranga 3112
+64 9 526 4551	+64 9 525 0568	+64 3 343 5201	+64 9 525 0568
IANZ# 1327	IANZ# 1308	IANZ# 1290	IANZ# 1402

Sample Receipt Advice

Company name:	GHD Pty Ltd QLD
Contact name:	Liz Kneen
Project name:	Norfolk Island
Project ID:	12649533
Turnaround time:	5 Day
Date/Time received	Oct 3, 2024 3:35 PM
Eurofins reference	1145567

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	Sample Temperature of chilled sample on the batch as recorded by Eurofins Sample Receipt : 10.3 degrees Celsius.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
X	Split sample sent to requested external lab.
X	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

James McCann on phone : 0499 810 009 or by email: JamesMcCann@eurofins.com

Results will be delivered electronically via email to Liz Kneen - Liz.Kneen@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd QLD email address.

eurofins

web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

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6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Unit 1,2 Dacre Street	1/21 Smallwood Place	1/2 Frost Drive
Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	NSW 2304
+61 3 8564 5000	+61 3 8564 5000	+61 2 9900 8400	+61 2 6113 8091	T: +61 7 3902 4600	+61 2 4968 8448
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794 & 2780	Site# 25079

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Site# 2370 & 2554

Eurofins Environment Testing NZ Ltd
NZBN: 9429046024954

Auckland	Auckland (Focus)	Christchurch	Tauranga
35 O'Rorke Road	Unit C1/4 Pacific Rise,	43 Detroit Drive	1277 Cameron Road,
Penrose,	Mount Wellington,	Rolleston,	Gate Pa,
Auckland 1061	Auckland 1061	Christchurch 7675	Tauranga 3112
+64 9 526 4551	+64 9 525 0568	+64 3 343 5201	+64 9 525 0568
IANZ# 1327	IANZ# 1308	IANZ# 1290	IANZ# 1402

Company Name: GHD Pty Ltd QLD
Address: 145 Ann Street
Brisbane
QLD 4000

Project Name: Norfolk Island
Project ID: 12649533

Order No.:
Report #: 1145567
Phone: 07 3316 3000
Fax: 07 3316 3333

Received: Oct 3, 2024 3:35 PM
Due: Oct 11, 2024
Priority: 5 Day
Contact Name: Liz Kneen

Eurofins Analytical Services Manager : James McCann

Sample Detail						Per- and Polyfluoroalkyl Substances (PFASs)
Brisbane Laboratory - NATA # 1261 Site # 20794 & 2780						X
External Laboratory						
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**	
1	QA2	Sep 26, 2024		Water	B24-Oc0008390	X
2	QA3	Sep 26, 2024		Water	B24-Oc0008391	X
Test Counts						2

GHD Pty Ltd QLD
145 Ann Street
Brisbane
QLD 4000

Attention: **Liz Kneen**

Report **1145567-W**
Project name Norfolk Island
Project ID 12649533
Received Date Oct 03, 2024

Client Sample ID			**QA2**	**QA3**
Sample Matrix			**Water**	**Water**
Eurofins Sample No.			**B24-Oc0008390**	**B24-Oc0008391**
Date Sampled			**Sep 26, 2024**	**Sep 26, 2024**
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	< 0.01	< 0.01
Perfluorohexanoic acid (PFHxA)[N11]	0.01	ug/L	< 0.01	0.01
Perfluoroheptanoic acid (PFHpA)[N11]	0.01	ug/L	[N09]0.01	< 0.01
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	[N09]0.02	< 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
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	%	125	123
13C5-PFPeA (surr.)	1	%	130	131
13C5-PFHxA (surr.)	1	%	120	124
13C4-PFHpA (surr.)	1	%	120	142
13C8-PFOA (surr.)	1	%	115	121
13C5-PFNA (surr.)	1	%	128	113
13C6-PFDA (surr.)	1	%	169	133
13C2-PFUnDA (surr.)	1	%	132	130
13C2-PFDoDA (surr.)	1	%	97	104
13C2-PFTeDA (surr.)	1	%	76	95
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	%	70	86
D3-N-MeFOSA (surr.)	1	%	90	120

Client Sample ID			QA2	QA3
Sample Matrix			Water	Water
Eurofins Sample No.			B24-Oc0008390	B24-Oc0008391
Date Sampled			Sep 26, 2024	Sep 26, 2024
Test/Reference	LOR	Unit		
Perfluoroalkyl sulfonamido substances				
D5-N-EtFOSA (surr.)	1	%	95	123
D7-N-MeFOSE (surr.)	1	%	86	137
D9-N-EtFOSE (surr.)	1	%	64	96
D5-N-EtFOSAA (surr.)	1	%	151	116
D3-N-MeFOSAA (surr.)	1	%	98	101
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	[N09]0.05
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	< 0.01	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	< 0.01	[N09]0.12
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	119	124
18O2-PFHxS (surr.)	1	%	123	131
13C8-PFOS (surr.)	1	%	119	117
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)[N11]	0.01	ug/L	< 0.01	< 0.01
13C2-4:2 FTSA (surr.)	1	%	129	99
13C2-6:2 FTSA (surr.)	1	%	153	115
13C2-8:2 FTSA (surr.)	1	%	146	129
13C2-10:2 FTSA (surr.)	1	%	137	107
PFASs Summations				
Sum (PFHxS + PFOS)*	0.01	ug/L	< 0.01	0.17
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	0.02	0.12
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	0.02	0.17
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	< 0.05	0.18
Sum of PFASs (n=30)*	0.1	ug/L	< 0.1	0.18

Sample History

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

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	Oct 10, 2024	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Oct 10, 2024	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Oct 10, 2024	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Oct 10, 2024	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

eurofins

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Eurofins Environment Testing Australia Pty Ltd
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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794 & 2780	Site# 25079

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Project Name: Norfolk Island
Project ID: 12649533

Order No.:
Report #: 1145567
Phone: 07 3316 3000
Fax: 07 3316 3333

Received: Oct 3, 2024 3:35 PM
Due: Oct 11, 2024
Priority: 5 Day
Contact Name: Liz Kneen

Eurofins Analytical Services Manager : James McCann

Sample Detail						Per- and Polyfluoroalkyl Substances (PFASs)
Brisbane Laboratory - NATA # 1261 Site # 20794 & 2780						X
External Laboratory						
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**	
1	QA2	Sep 26, 2024		Water	B24-Oc0008390	X
2	QA3	Sep 26, 2024		Water	B24-Oc0008391	X
Test Counts						2

Internal Quality Control Review and Glossary

General

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

Holding Times

Please refer to the '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 before sample receipt deadlines as stated on the SRA.

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

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

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ppm:** parts per million
µg/L: micrograms per litre	**ppb:** parts per billion	**%:** Percentage
org/100 mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100 mL:** Most Probable Number of organisms per 100 millilitres
CFU: Colony Forming Unit	**Colour:** Pt-Co Units (CU)	

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - 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.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however, free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 6.0
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should only be used as a guide and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

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%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%, VOC recoveries 50 – 150%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 6.0, where no positive PFAS results have been reported or reviewed, and no data was affected.

QC Data General Comments

1. Where a result is reported as 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 are not data from your samples.
3. 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.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. 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)	%	101			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	105			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	108			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	113			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	93			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	88			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	86			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	83			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	80			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	103			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	83			50-150	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	116			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	95			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	88			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	%	111			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	%	108			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	82			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	85			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	98			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	100			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	99			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	107			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	100			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	97			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	143			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	75			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	102			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	%	102			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	90			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	94			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)	B24-Oc0008391	CP	%	107			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	B24-Oc0008391	CP	%	103			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	B24-Oc0008391	CP	%	116			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	B24-Oc0008391	CP	%	115			50-150	Pass	
Perfluorooctanoic acid (PFOA)	B24-Oc0008391	CP	%	110			50-150	Pass	
Perfluorononanoic acid (PFNA)	B24-Oc0008391	CP	%	113			50-150	Pass	
Perfluorodecanoic acid (PFDA)	B24-Oc0008391	CP	%	108			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	B24-Oc0008391	CP	%	114			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	B24-Oc0008391	CP	%	128			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	B24-Oc0008391	CP	%	118			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	B24-Oc0008391	CP	%	104			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	B24-Oc0008391	CP	%	104			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B24-Oc0008391	CP	%	91			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	B24-Oc0008391	CP	%	101			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	B24-Oc0008391	CP	%	104			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B24-Oc0008391	CP	%	101			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	B24-Oc0008391	CP	%	112			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	B24-Oc0008391	CP	%	93			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	B24-Oc0008391	CP	%	120			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	B24-Oc0008391	CP	%	103			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	B24-Oc0008391	CP	%	101			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	B24-Oc0008391	CP	%	124			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	B24-Oc0008391	CP	%	119			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	B24-Oc0008391	CP	%	127			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	B24-Oc0008391	CP	%	102			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	B24-Oc0008391	CP	%	114			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	B24-Oc0008391	CP	%	92			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	B24-Oc0008391	CP	%	123			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	B24-Oc0008391	CP	%	129			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)	B24-Oc0024647	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	B24-Oc0024647	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	B24-Oc0024647	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	B24-Oc0024647	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	B24-Oc0024647	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	B24-Oc0024647	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	B24-Oc0024647	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	B24-Oc0024647	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	B24-Oc0024647	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	B24-Oc0024647	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	B24-Oc0024647	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	B24-Oc0024647	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	B24-Oc0024647	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B24-Oc0024647	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	B24-Oc0024647	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	B24-Oc0024647	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B24-Oc0024647	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	B24-Oc0024647	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	B24-Oc0024647	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	B24-Oc0024647	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	B24-Oc0024647	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	B24-Oc0024647	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	B24-Oc0024647	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	B24-Oc0024647	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	B24-Oc0024647	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	B24-Oc0024647	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)	B24-Oc0024647	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	B24-Oc0024647	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	B24-Oc0024647	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	B24-Oc0024647	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:

James McCann	Analytical Services Manager
Jonathon Angell	Senior Analyst-PFAS

Glenn Jackson
Managing Director

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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