Australian Government

Department of Infrastructure, Regional Development and Cities

INVESTIGATION INTO ALLEGATIONS OF WASTE MISMANAGEMENT PRACTICES BY AIRSERVICES AUSTRALIA AT DARWIN INTERNATIONAL AIRPORT

FEBRUARY 2019

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ABBREVIATIONS

AEO	Airport Environment Officer - Under the *Airports Act 1996*, each Commonwealth owned airport is designated an Airport Environment Officer. The officer regulates the federally-leased airport under the Airports (Environment Protection) Regulations 1997.
AEPR	Airports (Environment Protection) Regulations 1997
ARFFS	Aviation Rescue Fire Fighting Services
DIA	Darwin International Airport Pty Ltd
HFTG	Hot Fire Training Ground - the current Darwin ARFFS Training Ground located on the military side of the airport
LMU	Large Mock Up – another reference for the HFTG site
NEMP	PFAS National Environmental Management Plan released on 16 February 2018
NEPM	National Environment Protection (Assessment of Site Contamination) Measure 1999 (amended 2013)
PFAS	per- and poly-fluoroalkyl substances
PFHxS	perfluorohexane sulfonate
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate

1. EXECUTIVE SUMMARY

The Department of Infrastructure, Regional Development and Cities (the Department) is responsible for the regulation of 22 federally-leased airports. These airports are located on Commonwealth land and leased to private entities. The federally-leased airports are regulated under the *Airports Act 1996* (the Act) and associated regulations, including the Airports (Environment Protection) Regulations 1997 (AEPR).

The Secretary of the Department appoints Airport Environment Officers (AEOs) under regulation 10.01 of the AEPR to oversee each federally-leased airport's compliance with its environmental responsibilities under the AEPR. The AEOs are authorised to make decisions regarding compliance with the airport regulatory regime and to take compliance action when there is a breach of the AEPR.

Darwin International Airport is classified as a joint-user airport under section 7B of the Act. It is a civil-military airport with the civil side leased to Darwin International Airport Pty Ltd (DIA) and the military side owned and managed by the Department of Defence (Defence) for facilitating operations by the Royal Australian Air Force (RAAF).

Airservices Australia (Airservices) provides Aviation Rescue Fire Fighting Services (ARFFS) on the civil side of the airport and is under contract from Defence to provide the same service on the military side.

The AEO at Darwin International Airport has undertaken an environmental regulatory investigation of Airservices' ARFFS operations and facility at the airport. The AEO's investigation relates to allegations received from a complainant on 23 February 2018 regarding Airservices' waste management practices on the airport site and potential impact on the environment.

These allegations were forwarded to the Department via 42 emails from the complainant. From the information provided, the Department considered an environmental regulatory investigation by the AEO was appropriate.

The investigation examined whether all the allegations could be substantiated, and if so, whether the alleged conduct contravened relevant provisions of the AEPR, in particular:

- regulation 4.01, which imposes a duty on the operator of an undertaking at an airport to take all reasonable and practicable measures to prevent the generation of pollution from the undertaking or, if prevention is not reasonable or practicable, to minimise the generation of pollution from the undertaking; and
- regulation 6.05, which relevantly requires an occupier of part of an airport site to establish and maintain its own appropriate systems of monitoring the environmental consequences of its activities and the activities of other persons in the area occupied.

These requirements only apply in relation to Airservices' undertakings on the civil side of the airport, and not in relation to its undertakings on the military side. However, as the allegations also relate to a site on the military side, the Department has consulted with Defence and, at its request, has included Airservices' activities on the military side of the airport in this investigation. The Department has also engaged with the airport and the Northern Territory Environment Protection Authority (NT EPA) to advise of the scope and progress of the investigation.

All the allegations were further explored during an interview between the complainant and the Darwin Airport AEO, who was supported by another Departmental AEO. Both AEOs also conducted several airport onsite inspections, held interviews with Airservices' staff, and examined Airservices' records and documents.

The 42 allegations are consolidated into the following eight core allegations:

1. WASTE WATER FROM THE HOT FIRE TRAINING GROUND (HFTG) WAS USED FOR IRRIGATION (POST-2010);
2. WASTE WATER FROM THE ARFFS 'MOCK UP' HFTG WAS RELEASED INTO THE STORM WATER SYSTEM;
3. WASTE WATER FROM THE WASH DOWN BAY AREA WAS RELEASED TO SEWER;
4. WASTE WATER FROM THE STATION RETENTION DAM WAS RELEASED TO STORM WATER (POST-SEPTEMBER 2017);
5. ACCIDENTAL DISCHARGES OF FOAM INTO THE ENVIRONMENT WERE NOT REPORTED THROUGH AIRSERVICES' STANDARD REPORTING PROCEDURES;
6. ENVIRONMENTAL CONTAMINATION FROM THE USE OF FIREFIGHTING FOAM DURING A BUSH FIRE INCIDENT ON DARWIN AIRPORT;
7. DISCHARGE OF CONTAMINATED WATER DURING DAILY TESTING OF FIRE TENDERS RESULTED IN IMPACTS TO STORM WATER DRAINAGE; and
8. SELLING OF TOTES TO THE PUBLIC.

The above allegations are purported to have occurred at four sites on the airport: three on the civil side and one on the military side. The Hot Fire Training Ground (HFTG) cited in the allegations is on Defence land.

The following is a summary of the findings from the investigation.

Allegation 1: waste water from the hot fire training ground (HFTG) was used for irrigation (post-2010)

This allegation asserts ARFFS personnel continued to use waste water from the HFTG for irrigation beyond 2010 despite an Airservices' direction to cease the practice. The HFTG is situated on the military side of the airport where regulation 4.01 of the AEPR does not apply to undertakings there.

Investigation conclusion: Regulation 4.01 of the AEPR does not apply to the alleged conduct. The investigation confirmed the use of waste water for irrigation purposes in the area immediately adjoining the HFTG up to 2010 and that in 2010 an Airservices' Local Instruction was issued to direct staff to cease this practice. However, the investigation highlighted the lack of internal checks to determine if Airservices' staff were complying with the Local Instruction. While a number of waste disposal certificates indicated appropriate removal of waste water from the HFTG via a licensed waste facility post-2010, there were intermittent gaps in the records. Therefore, there is insufficient evidence to confirm that the practice of using waste water for irrigation purposes was fully discontinued after 2010.

Allegation 2: **waste water from the ARFFS 'mock up' HFTG was released into the storm water system**

This allegation asserts Darwin ARFFS personnel deliberately discharged waste water from the HFTG to the storm water system. The HFTG is on the military side of the airport and regulation 4.01 of the AEPR does not apply to undertakings there.

Investigation conclusion: Regulation 4.01 of the AEPR does not apply to the alleged conduct. Nevertheless, the investigation confirmed the *ad hoc* release of waste water from the HFTG to storm water. However, in December 2017 the valve handles for release to storm water at the HFTG on the military side and the fire station training ground on the civil side of the airport were removed, thus preventing any further release of waste water to storm water at both training grounds.

Allegation 3: **waste water from the wash down bay area was released to sewer**

This allegation refers to Darwin ARFFS personnel transporting training pad runoff from the HFTG treated tanks to the fire station wash down bay for disposal to sewer.

Based on interviews with Darwin ARFFS personnel, it is understood this practice of transferring waste water from the training pad pits to sewer occurred between 2010 until September 2017. On 11 September 2017, Darwin ARFFS personnel were directed by DIA's Environmental Manager to cease all discharges to sewer, as this practice did not meet the trade waste discharge requirements of NT Power and Water Corporation. A review of waste certificates for the period September 2017 to April 2018 confirmed all subsequent waste water was disposed of via an accredited waste disposal contractor.

As this allegation is in relation to undertakings on the civil side of the airport, it was investigated against regulation 4.01 of the AEPR which imposes a general duty on the operator of an undertaking at an airport to take all reasonable and practicable measures to prevent the generation of pollution from the undertaking or, if prevention is not reasonable or practicable, to minimise the generation of pollution from the undertaking.

However, the definition of water pollution under regulation 2.02(3)(e) of the AEPR specifically excludes "water in a system for the passage of sewage".

Investigation conclusion: This allegation was substantiated up to September 2017, however it does not contravene regulation 4.01 of the AEPR. The practice of discharging to sewer ceased in September 2017 with all waste being subsequently diverted to a waste disposal contractor.

***Allegation 4*: waste water from the station retention dam was released to storm water (post-September 2017)**

This allegation asserts Darwin ARFFS personnel deliberately discharged contaminated waste water from the retention dam to storm water after being advised to cease disposal to sewer in September 2017.

This allegation was investigated against regulation 4.01 of the AEPR which imposes a general duty on the operator of an undertaking at an airport to take all reasonable and practicable measures to

prevent the generation of pollution from the undertaking or, if prevention is not reasonable or practicable, to minimise the generation of pollution from the undertaking.

A review of waste tracking certificates by the investigators determined that collection of waste from the station retention dam occurred at the beginning and end of the 2017/2018 wet season. This collection of waste meant there was no deliberate release of waste water from the retention dam after September 2017.

In December 2017, Airservices removed the valve controller at the station retention dam. This prevented the potential for future waste water release from the retention dam into storm water.

Investigation Conclusion: The allegation is not substantiated.

Allegation 5: **accidental discharges of foam into the environment were not reported through Airservices' standard reporting procedures**

This allegation asserts Darwin ARFFS personnel failed to report up to 30 incidents of accidental foam discharge during training or daily operational checks.

The allegation was investigated against regulation 6.05(1)(a) of the AEPR in relation to whether Airservices was establishing and maintaining its own appropriate system or systems of monitoring the environmental consequences of its activities.

A number of emails were sent to Darwin ARFFS personnel from senior Airservices' officers in 2015 and 2016 reminding staff to check the foam switch was in the 'off' position prior to conducting daily checks and training activities to ensure that water, and not foam, was released. The complainant asserted these emails indicated that additional instances of accidental foam discharge had occurred and not been reported. The complainant provided no further evidence to substantiate this allegation.

As part of this investigation, four current Darwin ARFFS personnel were interviewed separately and questioned about instances of accidental discharge. All personnel consistently advised they were not aware of, or had not witnessed, any instances of accidental discharge that were not reported to Airservices via the electronic reporting system.

The investigators were unable to determine, through Airservices' foam tracking system, whether minor amounts of foam had been accidently discharged. A review of Airservices' foam reserve stockpile records found that during the period 2013 to late 2016, the records did not adequately report minor foam spills in fire tenders. However, amounts associated with significant/operational incidents were recorded. Airservices' current foam recording system does not appear to be fully auditable and requires review to ensure accurate accounting of minor foam discharges.

Investigation conclusion: The allegation is not substantiated. However, it is recommended Airservices ensure an accurate accounting of minor foam discharges is in place in accordance with regulation 6.05(1) of the AEPR.

Allegation 6: **environmental contamination from the use of firefighting foam during a bush fire incident on Darwin Airport**

The complainant asserts Darwin ARFFS personnel used firefighting foam during a bush fire incident both on the civil and military side of the airport between 11-14 September 2015 and that ARFFS personnel hid this fact and any potential impacts this operation may have had on the environment.

This allegation was investigated against regulation 4.01 of the AEPR which imposes a general duty on the operator of an undertaking at an airport to take all reasonable and practicable measures to prevent the generation of pollution from the undertaking or, if prevention is not reasonable or practicable, to minimise the generation of pollution from the undertaking.

As part of this investigation, four current Darwin ARFFS personnel were interviewed separately and questioned whether foam was used during the bush fire incident in September 2015. All interviewed personnel who attended the incident advised only water was used to control the fire. ARFFS personnel noted the only circumstance where foam may be discharged for bush fire incidents is when the ammunition bunkers are threatened, but this was not the case for this incident.

A review of Airservices' records of reserve foam stockpiles identified no foam was used during this period.

Investigation conclusion: The allegation is not substantiated.

Allegation 7: **discharge of contaminated water during daily testing of fire tenders resulted in impacts to storm water drainage**

The complainant alleged that accidental discharges of foam during daily testing of fire tenders on Rescue Road had resulted in 'tainted' waters impacting the storm water drainage system.

This allegation was investigated against regulation 4.01 of the AEPR which imposes a general duty on the operator of an undertaking at an airport to take all reasonable and practicable measures to prevent the generation of pollution from the undertaking or, if prevention is not reasonable or practicable, to minimise the generation of pollution from the undertaking.

Airservices' records and interviews confirmed that accidental discharges of small amounts of foam occurred in early 2018 on Rescue Road as a result of the foam switch being in the 'on' position. The incident reports and interviews indicate that pollution control equipment was used to contain and collect spills or the accidentally released foam was left to evaporate.

No results of testing of soil or ground or surface waters are available for this area, however from previous Airservices' sampling results of effluent runoff from concrete and similar materials, it is reasonable to expect that leaching of PFAS may be occurring and impacting waters in the immediate vicinity. Further investigation is required to determine whether there are adverse impacts to the storm water drainage system.

Investigation conclusion: There is insufficient information to substantiate this allegation. In accordance with regulation 6.05(1) of the AEPR, it is recommended Airservices expand its current monitoring program to include monitoring of surface and ground waters on a routine basis around

its facilities to support the monitoring program currently being conducted by DIA. Furthermore, in accordance with regulation 4.03 of the AEPR, it is recommended Airservices consider relocating future daily testing of fire tenders to an area designed to capture accidental foam discharges.

Allegation 8: **selling of totes to the public.**

The complainant alleged that up to 50 empty plastic totes (with a volume of approximately 1000L each), which was used for storing Aqueous Film Forming Foam (AFFF) and other liquids, were sold to the public. The complainant provided no evidence or documentation in support of this allegation.

Investigation conclusion: The provision of totes to the public does not fall within the meaning of 'pollution' in Part 2, Division 1 of the AEPR, thus regulation 4.01 of the AEPR does not apply to it. Nevertheless, the AEO has investigated this matter and determined there is no substantive evidence to confirm this allegation, only anecdotal evidence. Interviews with Airservices' staff indicate that a small number of totes may have been sold approximately 15 years ago prior to 2003. Given the time passed, the number of totes involved cannot be determined. Airservices issued a direction in September 2009 that drums, totes or other containers previously containing AFFF were not to be reused for any purpose, but were to be stored in a bunded area until disposed of under national management arrangements. There is no evidence to suggest this instruction has been contravened.

Conclusion and discussion

Of the eight allegations made, Allegations 1 and 2 relate to undertakings at the Defence area of the airport which are not subject to the obligation in regulation 4.01 of the AEPR.

Allegation 3 was substantiated, however it does not contravene regulation 4.01 of the AEPR because the presence of a polluting substance in water in a system for the passage of sewage does not constitute 'water pollution' for the purposes of the AEPR. The practice of discharging waste water from the training pad pits to sewer by Darwin ARFFS personnel ceased in September 2017, with all waste being subsequently diverted to a waste disposal contractor.

Allegations 4, 5 and 6 were not substantiated and there was insufficient evidence to substantiate Allegation 7. Allegation 8 does not involve conduct regulated under the AEPR.

Nationally, Airservices undertakes Environmental Assurance Assessments (EAA) every two to three years. This program is designed to provide feedback to ARFFS management and personnel regarding environmental performance and to identify emerging issues with the potential for future environmental management implications in accordance with regulation 6.05(1) of the AEPR. The findings from each assessment are compared to those of previous assessments to identify non-compliances and areas for improvements. Where non-compliances are identified, actions for improvement are outlined.

A recurring issue was identified in assurance assessments which relates to the quality of waste water being discharged to sewer or storm water. A review by the investigators of EAAs from 2010 to 2017 suggests Airservices did not monitor storm water quality or act on the recommendations in the EAAs with regards to assessing the risk of releasing waste water to storm water.

Additionally, Airservices did not respond to issues identified in the audit and assurance reports that indicated Darwin ARFFS personnel were not operating in accordance with national directives and Local Instructions. Such repeated indications of non-compliance should have triggered direct intervention by Airservices to audit compliance with Local Instructions and initiate actions to ensure compliance.

It is also noted Airservices did not adequately monitor the waste disposal systems utilised at Darwin Airport through appropriate logging of waste tracking receipts or similar methods. In addition, a review of Airservices' records suggests that between 2010 and September 2017, Airservices did not adequately communicate with DIA or the AEO when incidents or failures of equipment had the potential to cause adverse impacts to the environment. This review also found the system currently being used to record foam volumes appears to not be fully auditable.

It is noted during the course of this investigation, Airservices reviewed and revised its Environmental Management System (EMS) and subordinate environmental documents. These changes should address many of the issues identified in this report. However, insufficient time has elapsed to demonstrate changes in practice have occurred. It is also noted that national guidance for the management of PFAS only became available in February 2018 with the release of the PFAS National Environmental Management Plan (NEMP).

Airservices has acknowledged PFAS containing foams have been used for control of aviation fires at Darwin Airport since 1995. Airservices used 3M Lightwater from 1995 to 2003, then transitioned to Ansulite which was thought to be PFAS-free at the time, but later found to contain trace amounts of PFAS. In 2010, Airservices transitioned to a PFAS-free foam (Solberg Rehealing RF6 foam) for operational responses at all civilian airports where Airservices provides ARFFS. Moreover, since 2010, Airservices ARFFS personnel have not used foam during routine training (only water is used).

At Darwin Airport, Airservices provides ARFFS under contract to Defence which, until recently, has required the use of Ansulite for incidents only. However, since 2010 Airservices has not had to use Ansulite foam for incidents at Darwin Airport. Airservices is currently in the process of transitioning to PFAS-free Solberg RF6 foam at Darwin Airport, with the transition expected to be completed in mid-2019.

Intermittent testing conducted by consultants engaged by Airservices in 2015, 2017 and 2018 at the Darwin Airport fire station facilities suggests residual traces of PFAS continue to leach from the training pad on the civil side of the airport. In addition, sampling undertaken in July 2014 during decommissioning of an underground tank at the Darwin station identified PFAS impacts to soil and groundwater.

Given the historical use of PFAS containing foams and the limited nature of sampling undertaken to date at Airservices' facilities on the civil side of the airport, it would be useful to conduct a risk assessment of the station training ground with regards to PFAS leaching. This information would be beneficial in developing a site-specific PFAS management plan and appropriate remediation measures.

Site Context

Darwin International Airport is located near two separate water catchment areas: Rapid Creek and Ludmilla Creek, which support productive ecosystems with environmental and social values.

Ludmilla Creek and wetlands lie to the west of RAAF Base Darwin, but the creek does not flow near the civilian side of the airport. Rapid Creek flows along the northern boundary of the airport on the civilian side and plays a role in biodiversity conservation. The creek and surrounding parkland are used for land based recreational activities, including harvesting of aquatic foods and swimming, and has cultural value to local indigenous communities.

The water quality of Rapid Creek is influenced by land uses within the nearly 30 square kilometre catchment. Rapid Creek receives storm water from a number of potential sources including, but not limited to, the Marrara sports ground, the Northlakes golf course and Darwin Airport.

Historically, runoff from the firefighting training ground and fire station on the civil side of the airport converged in a large open storm water drain which passed through a storm water interceptor, and eventually entered Rapid Creek. At the end of 2017, Airservices stopped releasing storm water from the civilian side training ground to the storm water drain. All waste water from the station training ground was removed via a licensed contractor. In addition, the switch to release to storm water was removed. Runoff from the station and its surrounds continues to enter a large drain which passes through an interceptor and then enters Rapid Creek.

Given the ecological importance of receiving environments for storm water runoff from the airport and Airservices' activities, it is important to understand any potential human health or ecological risks. This approach is consistent with the PFAS National Environmental Management Plan (NEMP) which advocates a risk-based approach to managing PFAS contamination issues. As a first step, targeted PFAS sampling and monitoring at Airservices' leased site on the civilian side of the airport will help to characterise PFAS levels to inform a site-specific PFAS management plan.

Recommendations

Under Part 6 Division 1 of the AEPR, there is a requirement for effective pollution monitoring and reporting, as well as establishing and maintaining appropriate environmental management systems. This will help to determine any presence or potential migration of contaminants from operational sites on the civilian side of the airport. On this basis, it is recommended Airservices:

1. expand its current monitoring program to include surface and ground waters on a routine basis to support the monitoring program being conducted by DIA. It is recommended Airservices work with the AEO and DIA to develop a sampling plan in alignment with the PFAS NEMP.

2. undertake a risk assessment of the station training ground with regards to PFAS leaching.

3. establish an equipment testing area specifically designed to capture accidental discharges of foam during daily or other routine equipment testing on the civilian side of the airport. The area should be appropriately designed with sufficient capacity to capture and retain discharges from the largest fire tender. It is also recommended the area be connected to a storage tank of sufficient capacity to hold any volume that can reasonably be expected to accumulate.

4. arrange for an independent ISO 14001 external review of its environmental management system at Darwin Airport.

5. review the implementation of its environmental management system to support compliance with these recommendations, national standards, guidelines and regulations, and Airservices' Local Instructions.

6. conduct annual audits to confirm on-ground actions by Darwin ARFFS personnel are compliant with Airservices' Local Instructions and national procedures, with a timely follow-up for any identified non-compliances.

7. ensure reporting of non-compliances or environmental incidents to DIA and the AEO where these actions have the potential to cause harm to the environment.

8. implement systems and controls to enable the accurate recording of foam usage and stockpiles. Procedures should be developed to ensure early identification of any discrepancy in vehicle and reserve foam stockpiles. This should include regular audits by a senior station officer and a record of full volumes for each container type. Annual audits should also be conducted to record and verify:

    - volumes of foam concentrate held onsite, broken down by container type;
    - count of empty and full totes;
    - maintenance records for topping up of tenders; and
    - records for disposal of empty totes by licensed waste contractors.

    Identified discrepancies should be reported to DIA, the AEO and, where relevant, to Defence, as soon as practicable.

9. continue ongoing collaboration with Defence to regularly review the environmental risks for the release of waste water from the hot fire training ground on the military side of the airport to ensure compliance with national standards and adequate protection of receiving environments.

Recommendations 1 to 6 above are consistent with the need to take all reasonable and practicable measures to prevent or minimise the generation of pollution as required under regulation 4.01 of the AEPR. Recommendations 1, 7 and 8 are consistent with the requirement under regulation 6.05 of the AEPR to ensure effective monitoring and reporting of environmental consequences of activities on the airport site.

Recommendations 1 and 2 regarding PFAS monitoring and conducting a risk assessment are consistent with the PFAS NEMP and the National Environment Protection (Assessment of Site Contamination) Measure 1999 (amended 2013). Recommendations 5 to 8 focus on procedural improvements to Airservices' current environmental management system and operational processes, as well as identify further areas for improvement; all of which are based upon the intent of the AEPR regulatory framework. The AEPR advocates continuous environmental improvement, including constantly improving environmental management practices for airport activities.

While the AEPR does not apply to the military side of the airport, Recommendation 9 is consistent with environmental best practice to take all reasonable and practicable measures to prevent or minimise the generation of pollution.

2. INTRODUCTION

2.1. BACKGROUND

On 9 February 2018, an aviation fire fighter employed by Airservices at Darwin Airport at the time, sent an email to the former Deputy Prime Minister and Minister for Infrastructure and Transport, the Hon Barnaby Joyce MP, alleging that Airservices' Aviation Rescue Fire Fighting Services (ARFFS) at Darwin Airport was deliberately and covertly contaminating the environment with hazardous waste, including PFAS and hydrocarbons. The complainant further alleged that the contamination was being conducted through covert mechanical systems and being facilitated by the management culture at the station. The complainant is currently no longer an Airservices' employee.

This email was subsequently forwarded to the Department of Infrastructure, Regional Development and Cities (the Department) for investigation under the *Airports Act 1996* and Airports (Environment Protection) Regulations 1997 (AEPR).

To progress the investigation, the Department requested the complainant provide additional information and details clarifying the basis of the allegations. Specifically, the complainant was requested to provide any information or evidence that identified and described the actual nature of the alleged deliberate contamination, the dates when the activities occurred, and any other evidence and information that may be relevant to the allegations.

In response, the complainant provided 42 emails on 23 February 2018 (**Appendix 4**) detailing numerous related allegations regarding the use and disposal of contaminants by Airservices' ARFFS staff, particularly effluent containing residual PFAS from firefighting training and other associated activities. The Department reviewed and analysed these emails to determine the specific issues that required investigation. The issues have been condensed into 8 core allegations:

1. WASTE WATER FROM THE HOT FIRE TRAINING GROUND (HFTG) WAS USED FOR IRRIGATION (POST-2010);
2. WASTE WATER FROM THE ARFFS 'MOCK UP' HFTG WAS RELEASED INTO THE STORM WATER SYSTEM;
3. WASTE WATER FROM THE WASH DOWN BAY AREA WAS RELEASED TO SEWER;
4. WASTE WATER FROM THE STATION RETENTION DAM WAS RELEASED TO STORM WATER (POST-SEPTEMBER 2017);
5. ACCIDENTAL DISCHARGES OF FOAM INTO THE ENVIRONMENT WERE NOT REPORTED THROUGH AIRSERVICES' STANDARD REPORTING PROCEDURES;
6. ENVIRONMENTAL CONTAMINATION FROM THE USE OF FIRE FIGHTING FOAM DURING A BUSH FIRE INCIDENT ON DARWIN AIRPORT;
7. DISCHARGE OF CONTAMINATED WATER DURING DAILY TESTING OF FIRE TENDERS RESULTED IN IMPACTS TO STORM WATER DRAINAGE; and
8. SELLING OF TOTES TO THE PUBLIC

2.2. SCOPE OF INVESTIGATION

As the Commonwealth regulator of Darwin International Airport, the Department has undertaken an environmental regulatory investigation into the 8 core allegations under the *Airports Act 1996* and the Airports (Environment Protection) Regulations 1997 (AEPR). The allegations have been investigated by two Departmental Airport Environment Officers (AEOs).

The investigation aimed to determine if Airservices' activities and environmental management system at Darwin Airport met the requirements of regulations 4.01 and 6.05 of AEPR.

To investigate the veracity of the allegations, the AEOs conducted interviews with the complainant and five Airservices' ARFFS current employees ranging from the Station Fire Commander to long serving line officers and a Senior Airservices Corporate Officer. The AEOs requested, and were provided with, copies of numerous documents and records from Airservices. The AEOs also conducted several onsite inspections of Airservices' Darwin ARFFS facilities.

The information obtained from these interviews and documents have been compiled against each allegation with summary details provided in **Section 4.1** of this report**. Sections 4.2** to **4.9** review the evidence and discuss the AEOs' findings, including whether each individual allegation is or is not supported by the evidence, and any additional observations or regulatory findings that the AEOs have identified. A regulatory discussion then follows, which outlines the application of the AEPR and other applicable environmental standards, including the PFAS National Environmental Management Plan (NEMP) released on 16 February 2018.

It should be noted that when considering the application of legislation or other standards on a Commonwealth Airport, the regulator must be mindful of the historical context for management or control of any potential contaminant. Operational procedures at the Darwin ARFFS station were developed at a time of limited knowledge of the environmental impacts from PFAS and were primarily designed to manage potential impacts from the discharge of hydrocarbons. This is evident, for example, from the procedure of cleaning the training ground at the end of each dry season. This process assisted in removing hydrocarbons, but is likely to have had limited benefit for PFAS removal. National guidance for the management of PFAS only became available in February 2018 with the release of the PFAS NEMP.

Recommendations are provided based upon the findings contained in the discussion and the applicability of the AEPR and appropriate standards for each allegation. A compilation of all recommendations is contained in **Chapter 5**.

2.3. SITE LOCATION

Darwin International Airport is located approximately 8km North East of the Darwin central business district. It is surrounded by the Stuart Highway, Bagot Road, McMillians Road and Amy Johnson Avenue (refer **Figure 1** below). The eastern and north eastern boundary of the site runs parallel to Rapid Creek. Approximately three quarters of the airport's surface water drains into Rapid Creek via sheet flow as well as storm water drains. The north western corner of the site drains into the Ludmilla Creek catchment.

The airport is a joint user airport as defined in the *Airports Act 1996* and is divided into two parts, with the civil section of the airport leased to and operated by Darwin International Airport Pty Ltd (DIA) and the military section operated by the Department of Defence as the Darwin RAAF Base.

The eight core allegations relate to incidents alleged to have occurred whilst the complainant was employed with Airservices' Darwin ARFFS at four locations on Darwin Airport: the ARFFS fire station, the station training ground and Rescue Road on the civil side and the Hot Fire Training Ground (also referred to as the Large Mock Up [LMU] area) on the military side of the airport.

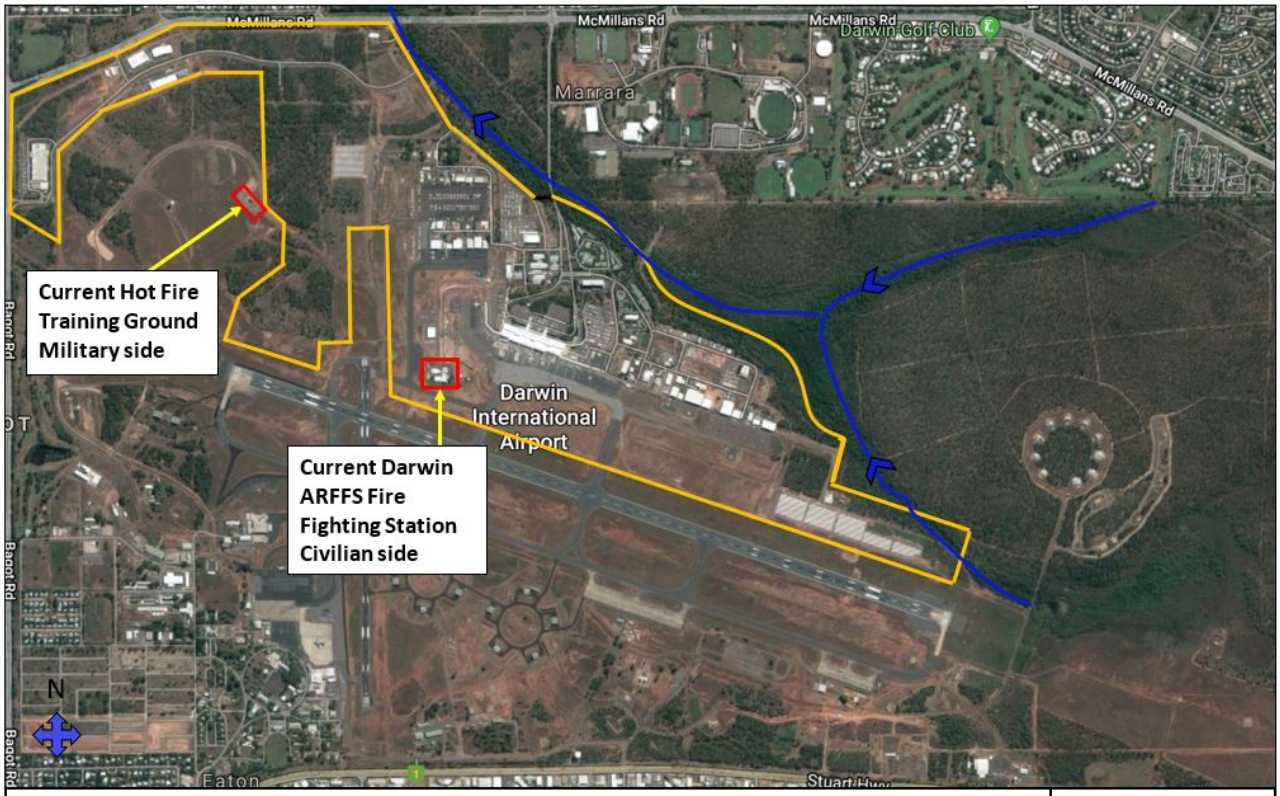

Figure 1: Location of current Darwin ARFFS Fire Fighting Station and current Hot Fire Training Ground

2.3.1. ARFFS Fire Station

The Darwin ARFFS Station is located on the civil side of the airport (refer **Figures 1** and **2**) and is located South West of the DIA terminal. The site comprises of:

- a bunded wash bay;
- a smoke hut;
- a training ground;
- a retention dam;
- the main station;
- a maintenance area;
- three bunded shipping containers;
- a main shed for the tenders (fire trucks);
- an undercover two phase separator; and
- a triple interceptor.

The locations of the buildings mentioned above are shown in **Figure 2**. The aerial photograph below differs from the site inspection photographs in the Appendices in one aspect - since this aerial photograph was taken Airservices has installed three additional bunded shipping containers.

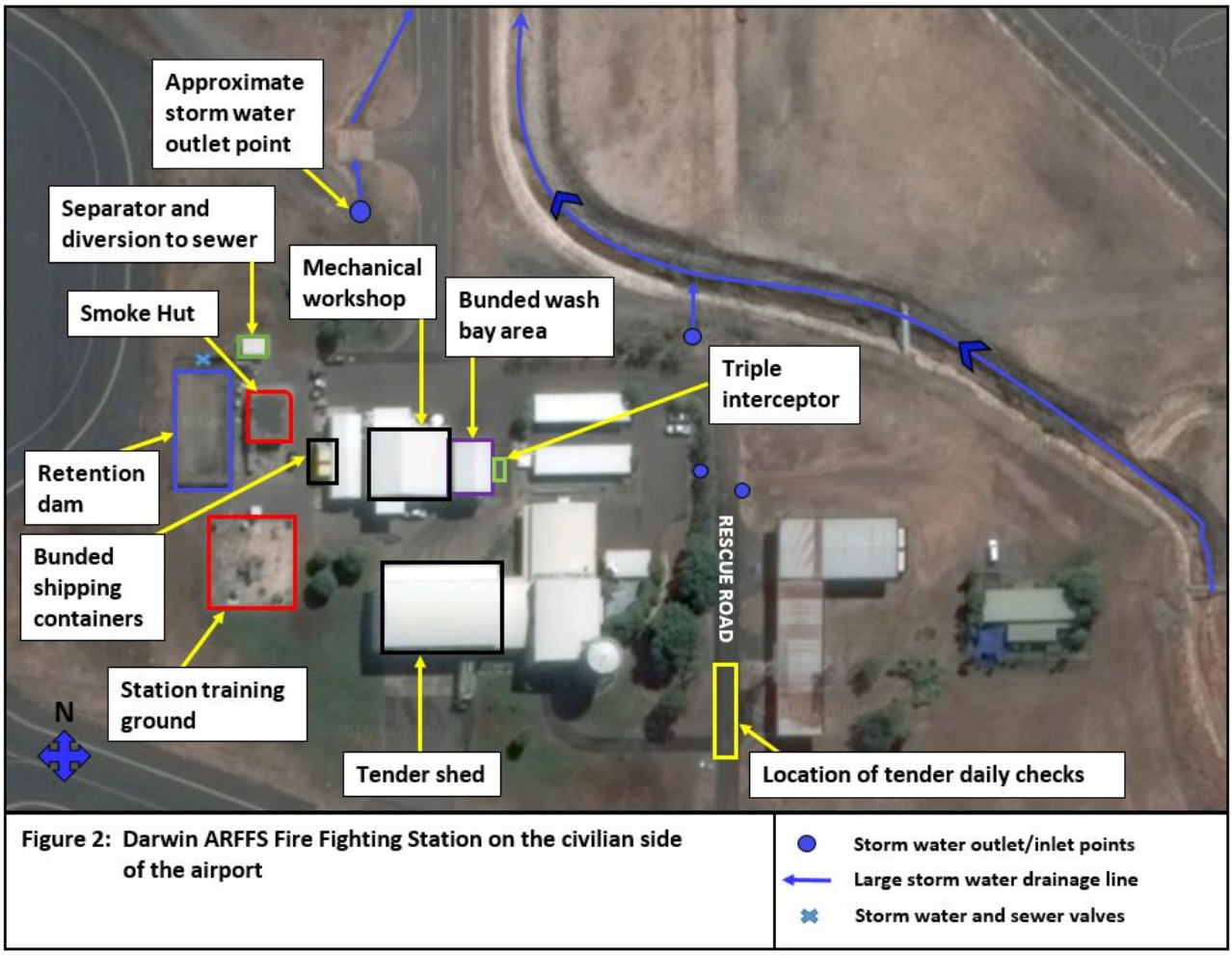

Figure 2: Darwin ARFFS Fire Fighting Station on the civilian side of the airport

2.3.2. Station training ground

The station training ground is located adjacent to the station and is equipped with facilities to allow ARFFS to conduct training with different fuel sources, depending on whether they require smoke and heat or a simple heat source. The facility may be fueled by lit fires (kerosene) for smoke and LPG for gas fires (heat). The station training ground has four drainage points (one in each corner) which drains into the station's retention pond/dam. The retention pond has two valves located at the northern end. One valve releases the water to storm water and the other releases the water to a two phase separator. The lever to release to storm water has been removed.

At the two phase separator, there are also two switches. The first, if opened, releases treated water to the storm water; the second releases treated water to the wash bay triple interceptor which then enters the sewer system.

Bunded wash bay area and mechanical workshop

The wash bay area is used for washing the tenders. Wash water is drained and diverted to the triple interceptor before being released to sewer. The mechanical workshop has a waste tank.

For all heavy greases and other wastes, a contractor is called to empty the tank. For lighter wastes, the water is transferred to the two phase separator which is then directed to the triple interceptor and released to sewer.

Rescue Road

Rescue road is located to the East of the station and is the subject of Allegation 7 which relates to contamination of storm water.

Water on this road drains from South to North with no drainage capture points at the Southern end and three at the Northern End.

The allegation refers to the daily testing of the fire tenders' water discharge systems which are activated to confirm that they are operational at commencement of the morning shift. The vehicles are parked at the Southern end of Rescue Road when this check is undertaken (**Figure 2)**.

Storm water and drainage lines

Drainage and surface water on the station is directed to a number of areas. The training ground and smoke hut have a concrete lined storm water drain which drains into the retention pond. All surface water on Rescue Road heads in a Northerly direction and enters the storm water system via two roadside storm water drains before being directed to the main unlined storm water drain. The majority of surface water from the site, if not directed to the interceptor or wash bay, enters the main unlined drain at the large storm water outlet point located at the Northern end of Rescue Road.

In the North West corner of the site is a storm water outlet point (that receives water from the retention pond) and is an open unlined drain. It can be seen in **Figure 2** that the water continues parallel to the large storm water drain and road. The drainage line then continues North until hitting the tarmac and turns east to travel under the road and enter the main storm water drainage line.

The main storm water drain flows north until turning East towards landside and exits at Gate India. It then enters a storm water drain that eventually discharges to Rapid Creek.

Groundwater

The most recent report that references groundwater direction on this site is the *Department of Defence Detailed Site Investigation 2017* (**Appendix 3**). This report indicates groundwater flows in a Northerly direction in September (the end of the dry season).

2.3.3. Hot Fire Training Ground

The Hot Fire Training Ground (HFTG) is the current Darwin firefighting station training ground located on the military side of the airport (**Figure 1**). The training ground is also referred to by two other names: 'the current fire training ground' in the Defence PFAS investigation reports and the 'Large Mock Up (LMU) area' as referenced by current Airservices' employees and the complainant. For consistency, this investigation will reference this training ground as the HFTG.

The HFTG consists of the following:

- a large training pad with a mock fire training aircraft constructed in the center of the pad.
  - The training pad is bunded and has a large drain located on the North East corner of the pad (**Figure 3**);
  - The training pad has two valves located on its North East border. One valve releases the water to storm water and one valve releases the water to a line which gravity feeds into an underground storage tank.
- the HFTG has two underground storage tanks:
  - one is located north of the small shed (**Figure 3**);
  - the second is located between the two sheds (**Figure 3**);
- two sheds:
  - the Northern shed houses the generator and a pump (**Figure 3**);
  - the second shed (the Southern shed) houses the oil phase separator (**Figure 3**);
- to the South of the HFTG site are two lines of trees bordering the graveled area and a decommissioned irrigation tap and stand;
- the trees and irrigation tap (marked by a red X in **Figure 3)** are discussed in Allegation 1.

Figure 3: Current Hot Fire Training Ground (HFTG) on the military side of the airport

Storm water and drainage from the Hot Fire Training Ground (HFTG)

As mentioned above, the training pad has two valves, the first valve discharges water from the training pad directly to storm water via the drainage channel located on the North East corner of the pad. The water travels along the open unlined drainage line in a Northerly direction before turning in an Easterly direction to enter the civil side of the airport via a concrete drain that traverses under an airside road. After exiting this drain, the water pools and then flows North through vegetation and along a dirt road. It then enters the Osgood Road open unlined drains where it travels East to eventually enter Rapid Creek.

The second valve gravity feeds the water into an underground storage tank. The pump and generator in the North Eastern shed transfer the water from the first underground storage tank to the two phase separator and into the second underground storage tank for storage prior to disposal. The second underground storage tank is referred to as the treated waste water tank.

Groundwater

The most recent report to measure groundwater direction on this site was the *Department of Defence Detailed Site Investigation 2017* (**Appendix 3**) where sampling undertaken in April 2017 indicated groundwater traveling in a North Easterly direction.

3. AEPR APPLICATION

3.1. SCOPE OF RELEVANT PROVISIONS

Darwin Airport is a joint civil-military airport with a joint-user deed with the Department of Defence (Defence) that governs the co-located operations of Darwin International Airport and the Royal Australian Air Force (RAAF). This investigation has been conducted on both the civilian and military sides of the airport.

The civilian part of Darwin Airport is subject to the *Airports Act 1996* and subordinate regulations, including the Airports (Environmental Protection) Regulations 1997 (AEPR), which are administered by the Department of Infrastructure, Regional Development and Cities (the Department).

The investigation examined whether Airservices Australia (Airservices) contravened regulation 4.01 of the AEPR by acting as alleged by the complainant. Regulation 4.01 imposes a duty on the operator of an undertaking at an airport to take all reasonable and practicable measures to prevent the generation of pollution from the undertaking or, if prevention is not reasonable or practicable, to minimise the generation of pollution from the undertaking. Regulation 4.01 only applies to undertakings on the civil side of the airport, and not to undertakings on the military side.

The investigation also considered whether Airservices met the requirement in regulation 6.05 to establish and maintain effective environmental monitoring and reporting systems. This requirement also only applies to Airservices' activities on the civil side of the airport.

Airservices has been contracted by Defence to provide ARFFS for both the civil and military sides of the airport. As the allegations mainly relate to Airservices' operations on the civil side of the

airport, the Department, as the Commonwealth regulator for the civilian part of the airport, has assumed responsibility for conducting this investigation.

Airservices ARFFS operations at Darwin Airport are conducted on four sites, with one of these sites located on Defence land and the remaining three sites on the civil side of the airport:

- the Hot Fire Training Ground (HFTG), also referred to as the Large Mock Up (LMU) area (military side);
- ARFFS Fire Station including wash bay, refueling area, foam storage facilities and maintenance facilities (civil side);
- the ARFFS station training ground and retention dam (civil side); and
- Rescue Road (civil side).

3.2. REGULATORY CONTEXT

The *Airports Act 1996* and the Airports (Environment Protection) Regulations 1997 (AEPR) set out the environmental regulatory requirements and standards applicable at all federally-leased airports, including Darwin International Airport. In accordance with Part 6, Division 1 of the AEPR, Airport Lessee Companies (ALCs) are required to have appropriate environmental monitoring, reporting and management systems which set out the procedures and processes used to monitor, report and manage potential impacts from their operations and the operations of their tenants on-airport.

The operational document to guide the day-to-day on-airport management for the ALC and its tenants is the Airport Environment Strategy (AES) which is part of the airport's approved Master Plan and updated every 5 years. The AES sets out the environmental requirements for the ALC and sets goals and targets to be achieved for the life of the AES. Regulation 6.02 of the AEPR requires the ALC to have appropriate systems and procedures in place to support the AES.

The AES is approved by the Federal Minister for Infrastructure and Transport and is expected to be consistent with current environmental management standards. This system also ensures that tenants are required to periodically address their own systems and procedures to ensure that they are compliant with current standards. The AES sets out the ALC's schedule for conducting environmental audits of tenant activities to determine if operations on-airport are meeting these standards. Operators are expected to address non-conformances in a timely manner.

Each federally-leased airport has an Airport Environment Officer (AEO) appointed under regulation 10.01 of the AEPR who monitors the airport's compliance with the AEPR and AES. The AEO receives reports of monitoring which has identified pollution or other non-compliance with the schedules in the AEPR or failures to comply with appropriate National Standards, including the National Environmental Protection Measures (NEPMs) and the PFAS National Environmental Management Plan (NEMP).

The AEPR sets out a system for enforcement of appropriate environmental standards and includes trigger levels for regulatory enforcement as a result of non-compliance with the standards set out in the schedules in the AEPR and through other triggers relating to adverse impacts to health and public safety.

Should the trigger levels within the AEPR be exceeded, the AEO may enforce compliance by issuing Directions or Orders requiring the polluter to cease discharge, conduct an investigation and, if required, complete remedial work.

4. ALLEGATIONS

The complainant forwarded 42 emails to the Department on 23 February 2018 (**Appendix 4**). Many of these emails contain numerous allegations which had to be reviewed to determine the specific issues that required investigation. It was determined the accusations could be compiled into 8 core allegations:

1. WASTE WATER FROM THE HOT FIRE TRAINING GROUND (HFTG) WAS USED FOR IRRIGATION (POST-2010);
2. WASTE WATER FROM THE ARFFS 'MOCK UP' HFTG WAS RELEASED INTO THE STORM WATER SYSTEM;
3. WASTE WATER FROM THE WASH DOWN BAY AREA WAS RELEASED TO SEWER;
4. WASTE WATER FROM THE STATION RETENTION DAM WAS RELEASED TO STORM WATER (POST-SEPTEMBER 2017);
5. ACCIDENTAL DISCHARGES OF FOAM INTO THE ENVIRONMENT WERE NOT REPORTED THROUGH AIRSERVICES' STANDARD REPORTING PROCEDURES;
6. ENVIRONMENTAL CONTAMINATION FROM THE USE OF FIREFIGHTING FOAM DURING A BUSH FIRE INCIDENT ON DARWIN AIRPORT;
7. DISCHARGE OF CONTAMINATED WATER DURING DAILY TESTING OF FIRE TENDERS RESULTED IN IMPACTS TO STORM WATER DRAINAGE; and
8. SELLING OF TOTES TO THE PUBLIC.

The results of the investigation for each allegation are presented below and discussed under the headings:

1. ALLEGATION - a brief description of the allegation.
2. LINES OF EVIDENCE – a list of documents and other evidence reviewed during the investigation.
3. DISCUSSION - detailed discussion of the allegation and the evidence reviewed to determine the veracity of the allegation.
4. REGULATORY APPLICATION - outlines the AEPR requirements applicable to the particular allegation.
5. OUTCOME AND RECOMMENDATIONS - discussion of the outcome of the investigation into the allegation and any recommendations.

4.1. COLLECTION OF LINES OF EVIDENCE FOR ALLEGATIONS

The lines of evidence provided in the following subsections represent the collection of information during the course of the investigation. Besides site inspections and interviews, a substantial

number of documents were reviewed. These are highlighted below with reference to the corresponding Appendix item:

- summaries of two site inspections specifically targeted to inform the investigation (**Appendix 1**);
- review of Airservices foam stock reports and foam stocktake emails (**Appendix 2**);
- review of all historical contaminated sites reports for the Hot Fire Training Ground (HFTG) and Darwin ARFFS Station (**Appendix 3**)
- complainant's emails and attachments (**Appendix 4**);
- transcript of interview with the complainant (**Appendix 5**);
- record of interviews with Airservices' employees (**Appendix 5**);
- list of Darwin ARFFS waste collection certificates and maintenance work orders (**Appendix 6**);
- review of Darwin ARFFS local instructions for waste removal (past and current instructions) (**Appendix 7**);
- review of Airservices corporate national procedures for waste removal (past and current) (**Appendix 8**);
- review of Airservices' Darwin ARFFS Internal Environmental Assurance Reports (the Department did not receive permission from Airservices to include these confidential reports in the appendices);
- BECA trade waste reviews and water analysis for the Darwin Airport fire station and HFTG (**Appendix 9**);
- review of Airservices' CIRRIS incident reports on the use of foam (**Appendix 10**).

4.2. ALLEGATION 1: WASTE WATER FROM THE HOT FIRE TRAINING GROUND (HFTG) WAS USED FOR IRRIGATION (POST-2010)

4.2.1. Allegation

A number of emails were forwarded by the complainant to the Department on 23.02.2018 outlining concerns that the Darwin ARFFS station was continuing to irrigate with waste water from the Hot Fire Training Ground (located on Defence land) after the activity was required to cease in 2010.

In support of this allegation, the complainant forwarded an email from a former Airservices' Darwin Fire Commander dated 22.05.2014 with the subject line: *FW. LMU training ground Diesel pump and controls*. The email states there is a new generator installed in the small shed at the Hot Fire Training Ground (HFTG) and indicates that the generator will run the separation and irrigation pumps.

4.2.2. Lines of Evidence

1. Airservices GHD Preliminary Site Contamination Assessment - Darwin ARFFS Drill Ground, September 2008, section 3.3.1 *Anecdotal Evidence Summary* (**Appendix 3**):
   water from the training pad is drained to a waste water tank, then pumped into a separator to a settling pit where it is extracted and used for irrigation.

2. Findings of Airservices Internal Audits conducted on the 6.08.2010:

   "Wastewater from the separator output-holding tank was re-routed via the installation of an underground agricultural pipe to a tap output in an adjacent grassy area. The fire crews installed the pipe themselves.

   The approved dispersal method for wastewater (a sprinkler hose system which widely distributed the waste), was removed, allowing wastewater to become concentrated around the outlet.

   While these seem to be minor changes, on neither occasion was the impact of such changes assessed through the application of the mandated risk screening process. Further, these changes demonstrate how on station 'adjustments' may lead to undesirable environmental impacts even whilst Airservices is working holistically to minimise these types of issues.

   Recommendations:

   Undertake a risk screening assessment.

   Write to Darwin airport to determine if Airservices EMS is adequate to cover the requirements of the Airport Environment Management Strategy."

3. Darwin ARFFS station Local Instruction dated 22.12.2010 (**Appendix 7**):

   "The training ground will only be used between 1 April and the onset of the wet season (possibly December).

   The irrigation system is not to be used until approved by Airservices Environment section.

   The [waste water] *holding tanks are to be emptied and treated by WasteMaster."*

4. Airservices GHD Site Contamination Assessment 2012, samples taken 27.05.2010, Table 13, (**Appendix 3**) - referenced from RAAF Base Human Health Risk Assessment (HHRA):

   Sediment sampling in the irrigation location, sample ID ATP17:

   PFOS max concentration is 254.5µg/kg

   PFOA max concentration is 5.7µg/kg.

5. Email from the previous Darwin Fire Commander dated 22.05.2014 indicated the new generator had been installed and would run the separator and irrigation pumps (**Appendix 4**).

6. BECA Site Visit Report no DN-APT-SSR-001 Report Date: 25.09.2015 (**Appendix 9**).

   "*trade waste in the collection tank is pumped through a Sepa-type coalescing plate separator. The effluent is collected by a treated effluent tank before being pumped to the airport sewage system."*

7. Env-Guide-0021 Water Quality Monitoring Guidelines for Wastewater and Rainfall Runoff, issued November 2016 (**Appendix 8**).

   The procedure requires that *"If there is a reasonable likelihood that an Airservices activity (past or current) is contaminating rainfall runoff and the runoff is not being processed through a wastewater treatment system before entering the environment, a contamination assessment is required. The assessment is to be undertaken in accordance with Airservices EMS requirements. The resultant assessment report will provide recommended management measures to be implemented if required."*

8. Video provided by the complainant of the Darwin ARFFS Hot Fire Training Ground and associated infrastructure taken on 17.09.2017 (**Appendix 1**). The video highlights that the irrigation pump remains connected within the facilities' shed and that the irrigation tap located in the tree line in the South Western corner of the site has not been removed, but it does not demonstrate that the line remains functional, i.e. discharging waste waters.
   a. During the video, the irrigation and separator pump are operational, with the irrigation switch board lights active and pump noise clearly heard.
   b. The complainant demonstrated that water from the training ground gravity feeds into the first underground storage tank, and is then pumped from the settling tank to the separator. Treated waters from the separator are then discharged to an underground holding tank for final disposal.
   c. The complainant operated the sludge valve at the base of the separator resulting in discharge of waste via a connected hose to an adjacent grassed area.

9. ARFFS Work orders – work orders for servicing environmental equipment, including emptying of holding tanks, were requested by the AEO as part of this investigation (**Appendix 6**).
   a. Maintenance certificates for 15.12.2015 – 22.11.2017 (not available).
   b. Work orders for cleaning out pits or maintenance of separator, which also involves pumping out of pits (not available for the period December 2009 – 15.08.2011).
   c. Work order no. 346618 provided for the cleaning out of the irrigation tank on 26.08.2009.
   d. Work order no. 273999 provided for priming of the irrigation pump on 10.09.2008.

10. Dates of completion for waste certificates provided to the AEO (**Appendix 6**).
   a. 3.11.2005, 20.12.2006, 9.07.2008, 23.04.2012, 8.09.2014, 22.11.2017, 26.02.2018, 16.03.2018.

      Note: ARFFS provided a copy of Airservices' email dated 20.06.2006 clarifying that NT does not require waste tracking for listed wastes. If the wastes are to be transported interstate, stations must retain certificates.

11. NT EPA soil testing results 27.02.2018 of the HFTG:
   a. Soil samples and a biota sample were taken from the area around the irrigation tap. The results provided do not indicate that duplicate soil or water samples were included. The quality assurance and quality control of the sampling cannot be confirmed, as it is a requirement of the NEPM 2013 to take duplicate samples when undertaking sampling of soil or water. The results can be considered as anecdotal evidence only.

      The results for the sample location near the irrigation tap were as follows:

Table 1: NT EPA sampling results from Hot Fire Training Ground (27.02.2018) - sediment and biota sampling taken near irrigation tap.

	SOIL Sample ID	**NEMP criteria (open space)**	**Plant specimen Sample ID**	**NEMP Criteria (wildlife diet mammal)**	**NEMP Criteria (bird)**
Analyte mg/kg	SED 3		BIOTA		

PFOS + PFHXs	0.089	1	0.0022	0.0046	0.0082
PFOA	<0.005	10	NA	NA	NA

12. AEO site inspection on 3.03.2018 notes the reticulation tap has been removed (**Appendix 1**).
13. AEO site inspection on 24.03.2018 notes the irrigation pump has been removed from the facilities' shed. However, the switch board remains unchanged with the label 'irrigation' still indicated on the panel (**Appendix 1**).
14. Airservices' Senior Operational Standards Specialist stated that training with foam was stopped by ARFFS in 2010 (Airservices Interview 13.04.2018).
15. In an interview with the AEO on 17.04.2018, the complainant stated the pipe from the pump to the irrigation tap was installed by himself and another employee in 2010 (**Appendix 5**).
16. Darwin RAAF Base draft Human Health Risk Assessment May 2018, section 5.3 *Soil* and subsection 5.3.1 *Nature and extent of impact* (**Appendix 3**):

    PFOS +PFHxS levels in the soil at the HFTG was found to be in the range of 3.2 – 254.5µg/kg at the location where the trees were irrigated (**Table 13**, **Appendix 3**). The NEMP criteria for Soil – human health screening levels, public open space is 1000µg/kg.

4.2.3. Discussion and Timeline

Refer to **Timeline 3** in the Appendix.

The first evidence that irrigation was occurring at the Darwin ARFFS Hot fire Training Ground (HFTG) was reported in the Airservices GHD report dated September 2008. The report provided anecdotal evidence that irrigation with waste water from the HFTG was occurring. Soil samples from the irrigated area, as part of Airservices GHD Site Contamination Assessment in 2012, indicated elevated levels of PFOS which suggests that irrigation from the HFTG previously occurred in this area.

An internal environmental assurance review undertaken on 6.08.2010 confirmed that fire crews had installed an irrigation line without seeking permission from Airservices' corporate area. The report provides no follow up actions to check that the irrigation system was no longer in operation. The report did not provide alternative actions for the disposal of water from the training pad, but recommended undertaking a risk assessment of the process. Future internal assurance reports undertaken in 2013, 2015 and 2018 did not include confirmation that the irrigation infrastructure had been dismantled or indicate if it was still being utilised.

The video taken by the complainant on 17.09.2017 highlighted that the irrigation system appeared to be intact but did not provide solid evidence that it was or could be used for disposal of waste waters by irrigation. An email by the previous Fire Commander on 22.05.2014 was provided by the complainant as confirmation that the generator can be used for both irrigation and processing of the waste water.

In an interview with an Airservices' employee at the Darwin ARFFS station as part of this investigation (**Airservices Interview no. 4, Appendix 5**), the interviewee stated, *"the irrigation pump pumps water from the treated tank*." In a separate interview (**Airservices Interview no. 5,**

Appendix 5), the Darwin ARFFS station Operation Manager stated, *"the irrigation pump is used to decant the water from the tank to the totes*".

To clarify, both Airservices' employees interviewed above have referred to the pump as the 'irrigation pump', however they have identified that the pump was used for more than the one purpose of irrigation. The irrigation pump was also used to pump water out of the tank into the totes. In the previous Fire Commander's email of 22.05.2014, he referenced the pump as the irrigation pump, however the email did not confirm the current purpose of the pump and the use of the term 'irrigation pump'. This term may be historical and related to the label used on the pump control board. This email did not confirm that irrigation was or was not being conducted in 2014.

Local Instructions at the Darwin ARFFS station were amended on 22.12.2010 to address the recommendations of Airservices internal environmental assurance report dated 6.08.2010 (**Appendices 7** and **9**). Refer to *Procedure Aviation and Rescue Fire Fighting Services part 4 Fire Station section Irrigation Control System Operation pg. 4-14* (**Appendix 7**)**.**

The instructions state:

"The irrigation system is not to be used until approved by Airservices Environment section. When this is achieved, new procedures will be included in Darwin ARFFS Local Instructions.

The holding tanks are to be emptied and treated by Waste Master - The Fire Commander will arrange collection as required."

The findings of Airservices' internal environmental assurance report of 2010 confirm that irrigation had been installed and was in use in 2010. This confirmed the complainant's memory of installing the trench in early 2010 (**Appendix 4**).

The installation of the irrigation system without consultation with Airservices' corporate area indicated a non-compliance with Airservices' national processes.

The Local Instruction to remove waste via a licensed waste facility was written in 2010, but interviews with Airservices' employees indicate that treated waste water was pumped to tote and transported to the station wash down bay area for disposal via sewer. Disposal via this method was conducted from 2010-2017, with station staff cleaning the concrete pad once per year prior to the commencement of the wet season. On completion of cleaning of the pad, a certified waste disposal remover was contacted to remove waste water from the tanks at the HFTG. This is reflected in the waste disposal certificates reviewed for 2010 – 2014, which confirmed that waste water from the HFTG was removed once in 2012 and once in 2014. For the remainder of the year, the waste water removal process can only be confirmed by anecdotal evidence provided by employees.

Practices at the station did not comply with the requirements of Airservices' national or local procedures. The internal environmental assurance reports identify this failure but the recommendations to change the Local Instructions were not followed up nor was the new process (transporting waste to the wash bay) assessed for impact via an environmental risk assessment. No actions were provided to check that the irrigation process was stopped or dismantled. This illustrates how the EMS did not conform with ISO 14001.

The allegation that the irrigation process continued after 2008 can be confirmed up until 2010, as it was recorded in an internal assurance review in 2010. However, as the next internal assurance reviews (2013 and 2015) did not check to see if the system had been dismantled to prevent further use, it cannot be confirmed whether the use of irrigation as a waste disposal process was discontinued after 2010.

Soil samples around the assumed irrigation area were taken by NT EPA (February 2018) and Defence (March 2018). The levels in the soil of PFOS + PFHxS and PFOA were below the NEMP open space criteria for both investigations.

4.2.4. Regulatory Application

The Hot Fire Training Ground (HFTG) is located on the military side of the airport and is administered by Defence (**Figures 1** and **3**). Regulation 4.01 of the AEPR does not apply to undertakings on the military side of the airport.

However, Defence has requested that the Department undertake the investigation of the allegations on the military side of the airport on its behalf and to provide a copy of the findings and recommendations for its consideration.

This review and discussion of the application of regulations and standards on Darwin Airport must be mindful that environmental management standards are progressed as knowledge is gained and legislation developed to manage identified issues. This is particularly true for the management of PFAS contamination which lacked an approved National Standard until the PFAS National Environmental Management Plan (NEMP) was released in February 2018 (**Timeline 1**).

As indicated in the discussion, use of PFAS contaminated waste water for irrigation purposes in the area immediately adjoining the Hot Fire Training Pad is confirmed up to 2010. Insufficient evidence is available to confirm if this practice continued after this time.

In 2010, Airservices was aware of the potential hazards from PFAS compounds and demonstrated appropriate management of the issue by advising the Darwin Fire Station to cease the practice of using PFAS contaminated waste water for irrigation. Darwin ARFFS personnel addressed this advice by amending their Local Instructions to direct staff to cease this practice.

The underlying guiding principle of the AEPR is for continuous improvement to environmental management. This has occurred in this case through the prohibition of the use of waste waters for irrigation purposes.

4.2.5. Outcome and Recommendations

Regulation 4.01 of the AEPR does not apply to this allegation as the conduct was alleged to have been carried out at the HFTG on the military side of the airport. Nevertheless, the investigation determined irrigation with waste water was undertaken at the HFTG until 2010 when Airservices issued a direction to cease this practice. After 2010, there is insufficient evidence to confirm that the practice of using waste water for irrigation purposes was fully discontinued after 2010.

It is highly recommended Airservices amend its Environmental Management Procedures to require timely follow-up of non-conformances and recommendations recorded in its internal and external Environmental Audits. Timely follow-up should assist Airservices to ensure the Darwin Fire Station

complies with audit recommendations, Airservices' Local Instructions and relevant national standards, regulations and guidelines. It would benefit Airservices to commission an independent audit of its Environmental Management System (EMS) to ensure it conforms to the requirements of ISO 14001 and AEPR reporting requirements.

4.3. ALLEGATION 2: WASTE WATER FROM THE ARFFS 'MOCK UP' HFTG WAS RELEASED INTO THE STORM WATER SYSTEM

4.3.1. Allegation

The complainant alleged that contaminated waste water from the Hot Fire Training Ground (HFTG) was intentionally discharged to storm water.

In support of this allegation, the complaint provided an email (**Appendix 4**) from the Operations Manager dated 26.10.2016, which states: *"Gents, The 2 in ground tanks are both over ¾ full. You are to immediately program actions to have these emptied. They are to remain that way. It is noticed that water is on the pad area. This is mainly rain water and will be reduced in quantity at the appropriate time."*

The complainant asserts that this email indicates that staff were to discharge the contents of the training pad to storm water without treatment.

4.3.2. Lines of Evidence

1. Airservices GHD Preliminary Site Contamination Assessment - Darwin ARFFS Drill Ground, September 2008, Figure 3 (**Appendix 3**):
   Soil sediment sampling near drainage line, Sample ID: BH5-02 - PFOS 1.6 mg/kg, PFOA 0.66 mg/kg.

2. Airservices Internal Environmental Assurance Report dated 6.08.2010 identifies that regular testing of water output quality from separators are not being conducted and that the effectiveness of the treatment equipment and resulting concentration of contaminants in waters being discharged to sewer or storm water are unknown.
   "Recommendations:
   Undertake a risk screening assessment.
   Write to Darwin airport to determine if Airservices EMS is adequate to cover the requirements of the Airport Environment Management Strategy"

3. Darwin ARFFS station Local Instruction dated 22.12.2010 (**Appendix 7**):

   "The training ground will only be used between 1 April and the onset of the wet season (possibly December).

   The irrigation system is not to be used until approved by Airservices Environment section.

   The [waste water] holding tanks are to be emptied and treated by WasteMaster."

4. Airservices GHD Site Contamination Assessment 2012, samples taken on 2.08.2012 (**Table 13**, **Appendix 3**):
   Sediment sampling in the drainage lines Sample ID 243-SED01: max PFOS concentration is 39,000 µg/kg, and PFOA max concentration is 42 µg/kg.

5. Airservices Internal Environmental Assurance Report March 2013 - comments regarding storm water release from the Large Mock Up (LMU) Hot Fire Training Ground:

"During rainfall events outside of the training season (Wet Season), water flows from the bunded hot fire-training pad to storm water (plate 9). The pad is cleaned prior to the conclusion of the training season and all contaminated cleaning water removed by a licensed waste contractor."
"Recommendations: Water quality monitoring to be undertaken at:

- *the outlet to storm water from the Hot Fire Training Grounds during "Non Training Season" including the testing of PFOS/PFOA levels*
- *the outlet from station treatment system to Darwin Airports sewer connection."*

6. Airservices Internal Environmental Assurance Report of September 2015:

"Review of past actions:
Water quality monitoring to be undertaken at:

- *the outlet to storm water from the Hot Fire Training Grounds during "Non Training Season" including the testing of PFOS/PFOA levels*
- *the outlet from station treatment system to Darwin Airports sewer connection"(*stated as completed but no evidence provided).

7. CIRRIS incident report no. OCC- 0006342 dated 21.08.2016: Large Mock Up (LMU) training pad (**Appendix 10**):

"During a training exercise, the foam switch was left in the on position and we produced foam through the foam-making branch.

The spill was contained in the bunded training ground.

I spoke with station commander [name]. He confirmed that the foam was contained on the pad. Approximately 50L of produced foam was released on the pad equivalent to (3L of Ansulite concentrate). As it is dry season the foam was left to evaporate. The drill ground is on RAAF land, no notification was made to RAAF since the release was on the pad. No notification was made to DIA. Station manager [name] also confirmed that the root cause was operator error, specifically the failure to set the foam switch to "off" during the training exercise. It appears that since there was no use of the spill kit as per ENV- GUIDE- 0004p7, there will be a residue of Ansulite on the pad from this spill, which over time will go through the WWTP and be disposed to sewer.

Waste water disposed of to sewer in wash bay area."

8. BECA Site Visit Report no DN-APT-SSR-001 Report Dated 25.09.2015 (**Appendix 9**):
Results of sampling of treated effluent tank following two days of rain fall identifies high PFOS and PFOA levels.

Table 2: BECA report DN-APT-SSR-001 (25.09.2015) - water sampling results for Hot Fire Training Ground and Darwin ARFFS station

Analyte	Unit	HFTG Separator weir	Station Separator	Station Wash bay	DIA TWA
PFOS	µg/L	256	1.44	69.9	0.3
PFOA	µg/L	87.7	0.077	7.45	0.3

6:2FtS	µg/L	18.1	<0.01	1.94	0.05
8:2FtS	µg/L	39.6	0.25	7.32	0.05

Actions required included:

"Consider performing a wider study on the levels of contamination at various points within the trade waste handling system, and the surrounding local environment with a view to identifying the risk of migration off-site and forming a plan to alter activities to reduce the risk monitor or remediate. This may include:

Measuring PFC's in storm water runoff from the pad to determine if storm water can be handled differently

Comparing PFC results directly sources from the pad with stagnant water in wastewater storage tanks, then consider bypassing or replacing highly contaminated equipment."

9. Email from former Fire Commander (forwarded by the complainant) dated 26.10.2016 (**Appendix 4**):

   "Gents,

   The 2 in ground tanks are both over ¾ full.

   You are to immediately program actions to have these emptied. They are to remain that way.

   It is noticed that water is on the pad area. This is mainly rain water and will be reduced in quantity at the appropriate time."

   No waste certificate was provided for waste removal at or around this date.

10. HFTG Work Orders (**Appendix 6**) - copies of Work Orders and waste certificates was requested by the Department for this investigation:

    a. Maintenance certificates for on or about 26.10.2016 were not available.

    b. It is noted that certificates for the period 15.12.2015 – 22.11.2017 were not available.

    c. Work Orders for the period December 2009 – 15.08.2011 were not available. Work Orders are required for pumping or cleaning out of the pits, as well as maintenance of the separator unit.

11. HFTG waste certificates (**Appendix 6**):

    a. Waste certificates were provided for 3.11.2005, 20.12.2006, 9.07.2008, 23.04.2012, 8.09.2014, 22.11.2017, 26.02.2018, 16.03.2018.

    b. A waste certificate for on or about 26.10.2016 was not available.

    c. No waste certificates were provided for the period 2015 and 2016.

    d. Note: ARFFS provided a copy of an Airservices' email dated 20.06.2006 clarifying that NT does not require waste tracking for listed wastes. If the wastes are to be transported interstate, stations must retain certificates.

12. No evidence was provided for the transport of waste water to the wash bay for disposal via sewer or collection by waste contractor.

13. Env-Guide-0021 dated 14.11.2016: Water Quality Monitoring Guidelines for waste water and rainfall runoff (**Appendix 8**):

The procedure states

"If there is a reasonable likelihood that an Airservices activity (past or current) is contaminating rainfall runoff and the runoff is not being processed through a wastewater treatment system before entering the environment, a contamination assessment is required. The assessment is to be undertaken in accordance with Airservices EMS requirements. The resultant assessment report will provide recommended management measures to be implemented if required."

14. AEO site inspection on 24.03.2017 revealed training was being undertaken in the wet season and water was being released to storm water (**Appendix 1**).

15. CIRRIS incident no. OCC-0007121 dated 4.09.2017 (**Appendix 10**):

    LMU training ground: *"We were conducting a training exercise when foam was produced from one of the vehicles in the exercise. The nearside outlet through a foam making branch.*

    Immediately shut the branch and shut down the pump. Under run the hose into the bunded pad, returned to station and parked the vehicle in the wash down bay which has a separator and vehicle was flushed out.

    Waste water removed by Cleanaway 22.11.2017."

16. The above incident coincides with the waste certificate provided by Airservices - Rec no. 286781 dated 22.11.2017 (**Appendix 6**).

17. In September 2017, the AEO was informed of the above event (CIRRIS incident event no. OCC-0007121) (**Appendix 10**) by the DIA environmental manager. The AEO requested that evidence be provided to confirm that the wash bay area is connected to sewer. DIA notified NT Power and Water Corporation of the incident and were advised that PFOS/PFOA was not included on their trade waste certificate. Result: Airservices required to store all wastes from incidents in the retention dam and arrange for disposal by certified waste contractor.

18. **Table 3: BECA site visit report 15.12.2017 (Appendix 9) – waste water sampling results for ARFFS station**

Analyte	Result (µg/L)	ANZECC – F 99% (µg/L)
PFOS	0.14	0.00023
PFOA	0.02	19
Sum of PFAS	0.45	N/A

19. Department of Defence RAAF Base Darwin Detailed Site Investigation – Per and Poly-fluoroalkyl Substances (PFAS) dated November 2017 (**Appendix 3**):

    Section 5.1.15 Current Fire Training Ground (NT0243)

    SOIL

    PFOS exceeded HIL (recreational – 1,200 µg/kg) – "the majority of impacts within the upper 0.5m of soils at the site, or within sediment samples from adjacent drainage areas (GHD 2012a)."

8.1.2 GROUNDWATER

"The maximum PFAS concentration in the dry season [2017] *sampling event was detected in 1302_243_MW02 (48 µg/L PFOS, 90 µg/L of total PFAS). The reported concentrations were approximately double those reported at the end of wet in April 2017, and the PFOS (but not PFOA) concentration is an order of magnitude higher than reported in March 2012. PFAS concentrations decrease with distance from the training area, with plumelines appearing to extend to the northeast toward 1302_MW191 (adjacent to Rapid Creek), and 1302_222_MW01 to the northwest. The PFAS impact migrating from the area is delineated to the west and north, and does not extend beyond the site boundary.*

The mix of PFAS compounds in 1302_243_MW02 differs from elsewhere onsite (Figure 8-11), and PFOA and fluorotelomers are relatively abundant consistent with Ansulite having been used at the training ground. The presence of non-PFOS/PFHxS compounds decreases with distance from the source area (Figure 8-12), although PFHxA is still relatively high compared to elsewhere in groundwater at the base."

Current Fire Training Ground (AEC 17) was identified as one of 6 key areas identified as containing significant levels of PFAS.

8.1.4 Infrastructure Sampling:

"Sampling of sediments, concrete or waste waters from selected infrastructure identified elevated concentrations in waste waters from the current fire training area. Concentrations in sediment collected from pits and concrete samples were not highly contaminated, although leaching may result in contribution to local surface water or groundwater contamination.

Several samples from the current fire training area (AEC17) waste water storage tank and pits reported concentrations of PFOS (0.83 to 210µg/L), PFOS + PFHxS (0.87 to 241µg/L), and PFOA (0.2 to 95µg/L). The liquids within these areas were all contained within the waste water training area fluid capture system of the waste storage tank and there is not a direct exposure pathway. Inappropriate handling and disposal of this waste water that leads to spills or environmental release, has the potential to lead to risks to human health or the environment."

20. BECA Darwin ARFFS Drainage study 2.02.2018 (**Appendix 9**):

"*It was identified that there is no formal agreement in place with Darwin International Airport Pty Ltd (DIA) for the discharge of trade waste to sewer, which is required under the terms of DIA's agreement. After initial discussions with DIA, clarity was sought over potentially contaminated waste streams that are generated at Airservices' facilities, and where these sources discharge."*

"BECA was asked to perform a study to investigate the sources and discharge of potentially contaminated materials to aid in discussions with DIA."

The report identified the following areas as sources for discharge to sewer and storm water:

HFTG (dry season) – training waste water and storm water treatment – coalescing plate separator. The report summarised that in the dry season waste water was treated and taken into IBC's to the ARFFS station to be discharged into the wash bay. Water sampling in this area revealed: Wastewater sample taken from effluent pad showed levels of PFOS 86.2µg/L, PFOS and PFHxs 103µg/L, PFOA 64.2µg/L and TPH C10-C36 320µg/L.

HFTG (wet season) - storm water not treated and released onto grass swale. A storm water sample was taken from a simulated wet season scenario, samples showed levels of. PFOS 1.31µg/L, PFOS and PFHxs 1.46µg/L, PFOA 0.1µg/L and TPH C10-C36 650µg/L.

Conclusion:

The HFTG wet season simulation did not allow enough time for the pad to drain into the tank before diverting to storm water. The hydrocarbon exceedance may be an over representation. Assessment of the effect of the PFOS/PFOA discharge on the environment and the division of responsibilities to deal with the risk are outside the scope of this assessment.

21. The regulators were not advised of the exceedances to storm water at the HFTG.

22. NT EPA soil testing results from sampling conducted on 27.02.2018:

The NT EPA took samples at the HFTG site, including a sediment sample from the open unlined storm water drain and a water sample from the storm water drain which is the discharge point from the HFTG pad. However, the results provided do not indicate that duplicate soil or water samples were included. The quality assurance and quality control of the sampling cannot be confirmed, as it is a requirement of the NEPM 2013 to take duplicate samples when undertaking sampling of soil or water. The results can be considered as anecdotal evidence only.

The results for the location are as follows.

Table 4: NT EPA sampling results from Hot Fire Training Ground (27.02.2018) - sediment and surface water sampling taken from Hot Fire Training Ground storm water drain

	Units	**Sample ID**	**NEMP criteria (open space)**
		Sed 2 taken from drainage line	
PFOS + PFHXs	mg/kg	0.31	1.0
PFOA	mg/kg	<0.005	10.0
		SW2 Sample taken from storm water drain	**NEMP criteria (recreational)**
PFOS + PFHXs	µg/L	26	0.7
PFOA	µg/L	3.9	5.6

23. Airservices Internal Environmental Assurance Report dated 16.04.2018 - findings:

"3.4 Potentially inadequate storm water management practices at the LMU pad during wet season not in accordance with LIs [Local Instructions].

Further details: During wet season, stormwater is allowed to collect on the pad and overflow into the environment.

Total capacity of the bunded LMU pad area and wastewater treatment plant (WWTP) holding tanks are insufficient to fully contain the volume of wet season rain. In dry season, evaporation plus containment is likely to be sufficient to manage wastewater volumes.

LIs do not adequately explain procedures relating to containment and discharge of storm water from the LMU pad during wet season.

3.7 Inadequate infrastructure: Site wastewater containment infrastructure and associated wastewater treatment plant (WWTP) at the station and LMU, is not effective in containing or removing residual PFAS from the waste water stream.

It is recognised that station infrastructure designed around 1990 is not capable of delivering contemporary environmental standards.

Noted that drill ground wastewater in the post-treatment holding tank is contained for licensed waste disposal.

Recommendations:

3.6 Recommended action 23: ARFFS engineering and property services to inspect the integrity of the bund and where require undertake necessary repairs to the training pad surfaces.

A1.2: Investigate and where required, commission repairs to be carried out on the training pad surfaces and bunds (23).

3.7 Recommended action 24: Undertake an investigation and risk assessment into the station's wastewater infrastructure, which will inform mitigation strategies and possible infrastructure improvements to achieve contemporary standards of environmental management.

A3.1: Undertake an investigation and risk assessment into the station's wastewater infrastructure, which will inform mitigation strategies and possible infrastructure improvements to achieve contemporary standards of environmental management (24). Ensure vehicle testing is included in this review (26)."

24. Darwin ARFFS Local Instruction dated 05.10.2017 prescribes the updated process for the flushing out of vehicles (**Appendix 7**):

"Flushing of Mk8 vehicles is to be completed at the LMU. MK8 vehicles are not to be driven on to the LMU pad. Park the vehicle as close as practical to the LMU pad.

All vehicle outlets are to be flushed with water only at the LMU training pad.

The foam and waste water that is contained at the LMU is to be removed by a certified waste disposal agency."

25. Darwin RAAF Base draft Human Health Risk Assessment July 2018 (**Appendix 3**):

5.3 Soil

5.3.1 Nature and extent of impact

AEC 17: Current Fire Training Ground (Appendix A, Figure 8g of the Darwin HHRA)

"On average the highest PFOS/PFHXs levels displayed as >1000 µg/kg are along the storm water drainage line."

A soil sediment sample taken from the SW drain on 7.09.2017 was PFOS 1200 µg/kg, exceeding the NEMP criteria for Soil – human health screening levels, public open space of 1000µg/kg. It did not exceed for PFOA.

4.3.3. Discussion and Timeline

Refer **Timeline 2** in the Appendix.

The complainant alleges in an email that *"adhoc disposal of water to storm water occurred from 2015-2016"*.

In mid-2010, the Darwin ARFFS Local Instructions were amended to limit training on the pad to the dry season. During the wet season, the storm water outlet was to be set to the open position to allow rainwater collected on the pad to be discharged to the storm water system. This process was confirmed by current Airservices' employees during interviews with the AEO. It was also detailed during interviews with Airservices' staff that:

"all water that is collected in the HFTG pad is first of all allowed to evaporate."

In **Airservices Interview no. 5** (**Appendix 5**) it is clarified that:

"all waste training water is drained into the underground storage tanks and is transported back to the wash bay area to be disposed to sewer".

In mid-2010, it was identified in Airservices' Internal Environmental Assurance Report that a risk assessment should be undertaken on the release of water from the pad to the storm water drain. This action was not followed up in future reports and there is no evidence provided that indicates an environmental risk assessment was conducted or storm water tested until the BECA 2018 report.

In 2012, the GHD Environmental Site Assessment identified there is high levels of PFOS in the sediment in the storm water drain. The results were above the NEPM Health Investigation Level (HIL) for industrial areas (refer to **Timeline 1** for applicable criteria at the time of the investigation). In mid-2013, Airservices' Internal Environmental Assurance Report recommended water quality testing at the storm water outlet. This report does not follow up on the actions recommended in previous environmental assurance reports.

In 2015, Airservices' Internal Environmental Assurance Report recommended that water quality testing be undertaken at the storm water outlet point. Actions from the previous reports were revisited and stated as completed with no evidence provided. From these reports, it is clear that Airservices' Corporate area was aware that there may be a problem with the process of diverting rainfall and water to the storm water drain. However, no alternate methods for waste removal were provided as an option for the station, besides the use of a waste contractor. There is no clear allocation of tasks for the suggested recommendations provided in each internal environmental assurance report. There is also no clear follow up to ensure completion of suggested recommendations contained within these reports.

On 21.08.2016, it was reported that a foam incident occurred on the Hot Fire Training Ground (HFTG) pad and was subsequently the subject of a CIRRIS incident report. The report states:

"All waste water was flushed into the treatment tanks and then transported in totes to be released into the wash bay area."

In September 2015, a BECA consultant undertook a site visit to conduct a trade waste management review. The report describes that the HFTG waste water is treated and subsequently pumped to sewer.

The BECA 2015 report water analysis indicated high levels of PFOS at the HFTG separator weir. It also indicated high PFOS concentrations at the station wash bay.

The BECA 2015 report recommends "*measuring the PFC's in the storm water to determine if the storm water can be handled differently*".

In October 2016 the former Fire Commander sent an email stating:

"Gents, The 2 in ground tanks are both over ¾ full.

You are to immediately program actions to have these emptied. They are to remain that way. It is noticed that water is on the pad area. This is mainly rain water and will be reduced in quantity at the appropriate time."

No waste certificates or maintenance work orders can be found for this date or around October 2016. It is noted that waste certificates and work orders were not provided for the period 15.12.2015 – 22.11.2017 for the HFTG. This gap coincides with the complainant's allegation that water was released to storm water in an *ad hoc* manner during this period, however it also coincides with the method of removing waste from the tanks and carting it to the wash down bay area. The gap in waste certificates is not confirmation that waste was released to storm water on an *ad hoc* basis.

At the end of 2016, an Airservices' national procedure was released requiring all sites that discharge water to storm water to undertake a risk assessment of the process.

The AEO noted on 24.03.2017 that training was being undertaken in the wet season and the waste from the training session had been released to storm water (**Appendix 1** - **Photo number 4**). The site inspection photographs of the storm water outlet highlight that the lavender coloured dry chemical powder (DCP) was flowing out of the storm water drain.

The findings of the AEO inspection indicates that the Darwin Local Instruction restricting use of the HFTG to the dry season, thus prohibiting training during the wet season, was disregarded by the station and resulted in waste water being discharged directly to storm water on that occasion.

The November 2017 Department of Defence Detailed Site Investigation (DSI) highlights that PFOS levels recorded in the groundwater during April 2017 had increased since previous testing conducted in 2012. The DSI indicated that the mix of PFAS compounds found on the HFTG site was unique to this site and was consistent with Ansulite being used at the training ground. The DSI concluded the plume was not migrating off-site.

The DSI also tested around the associated infrastructure at the HFTG and concluded:

"Sampling of sediments, concrete or waste waters from selected infrastructure identified elevated concentrations in waste waters from the current fire training area. Concentrations in sediment collected from pits and concrete samples were not highly contaminated, although leaching may result in contribution to local surface water or groundwater contamination."

No clear reason was provided for the high PFOS levels in the groundwater.

The NT EPA took soil and water samples from the HFTG site on 27.02.2018, but these results are only useful as anecdotal information since quality assurance samples were not taken or tested as required by the NEMP. The results of these samples indicate an exceedance of the NEMP recreational criteria in the water sample taken from the storm water drain for both the PFHXs + PFOS combination and the PFOA analytes. The site has been classed as recreational under the Department of Defence DSI. This investigation has been approved by an independent auditor which validates the choice of the site being classified as recreational. The HFTG will be referenced as recreational in this investigation. The sampling undertaken by the NT EPA (although anecdotal) was above the NEMP recreational criteria for PFOS.

In Airservices' 2018 Internal Environmental Assurance report it was recommended:

"23. ARFFS engineering and property services to inspect the integrity of the bund and where require undertake necessary repairs to the training pad surfaces.

A1.2: Investigate and where required, commission repairs to be carried out on the training pad surfaces and bunds.

24. Undertake an investigation and risk assessment into the station's waste water infrastructure, which will inform mitigation strategies and possible infrastructure improvements to achieve contemporary standards of environmental management.

A3.1: Undertake an investigation and risk assessment into the station's waste water infrastructure, which will inform mitigation strategies and possible infrastructure improvements to achieve contemporary standards of environmental management (24). Ensure vehicle testing is included in this review (26)."

This highlights that Airservices was aware that there was a problem with the waste disposal processes on the site and that the existing infrastructure at both training grounds needed reviewing.

In the 2018 BECA water analysis report, the wet season process of cleaning the pad, draining the wash water to a tank and then refilling the bunded training area and releasing to storm water was simulated. A sample was then taken from the water in the drainage line. The water sample results were: PFOS 1.3 µg/L, PFOS and PFHxs 1.46 µg/L, PFOA 0.1 µg/L and TPH C10-C36 650 µg/L. This indicates that storm water is being released with concentrations of PFOS and PFHxS which exceed the NEMP recreational water criteria. Defence was not advised of this exceedance. The results suggests that leaching of the HFTG infrastructure is occurring which is resulting in exceedances of PFOS and PFHxS.

The report concludes that the high hydrocarbon results are a result of the simulation not allowing enough time for the pad to drain in to the tank before diverting to storm water. The hydrocarbon exceedance may be an over representation. The report does not provide any further recommendations for communicating the exceedance to Defence. It also does not provide recommendations for remediating the area after the results indicated a release of water which contained elevated levels of contaminants.

The BECA 2018 report concluded that assessment of the effect of the discharge of PFAS on the environment and the division of responsibilities to deal with the risk were outside the scope of the report.

A number of actions noted above in Airservices' 2018 Internal Environmental Assessment had been highlighted in previous internal environmental assurance reports conducted in 2010, 2013, 2015 and the BECA water analysis reports in 2016, 2017 and 2018. There appears to have been a failure by ARFFS personnel to action the recommendations relating to waste water discharge to storm water from the HFTG within the 2010 - 2017 reports, neither was there any effective follow up by Airservices to ensure the completion of actions in regards to these matters.

This has resulted in release to storm water with no testing or other investigation or risk assessment undertaken up until 2018. The BECA 2018 water analysis report did undertake a risk assessment of the release of water to storm water and had identified that the water released was contaminated and the HFTG is a source of the contamination.

The internal environmental assurance report findings up until 2017 were given to both Airservices' Corporate area and the Darwin Fire Station and neither party actively put in place the suggested recommendation to test the storm water. The process was continued even after an Airservices' national procedure was released in 2016. In December 2017, the new station Fire Commander directed that the valve handles for release to storm water from both fire training grounds be removed. Neither Defence, nor DIA, were informed or consulted on this matter.

The allegation by the complainant of *ad hoc* release of waste waters to storm water is substantiated.

This conclusion is supported by the Department of Defence DSI and the 2012 GHD report which confirmed contamination in the storm water system by a mix of PFAS compounds consistent with Ansulite being used at the training ground. This has also been confirmed by the BECA 2018 water analysis storm water sampling results and the AEO's observations that training was being conducted during the wet season in March 2017.

Defence has prepared a detailed site investigation (DSI) report that includes the HFTG site, however it does not include potential PFAS sources from the civilian airport facilities. The report includes a more detailed understanding of PFAS and risks to receptors around the site and acknowledges the impact of PFOS and PFOA on the environment. Following the completion of the DSI, Defence has drafted a PFAS Management Area Plan which will inform the activities that will be undertaken to manage and reduce the risks of PFAS exposure on, and around, the RAAF Base. It is understood that the plan will be publically released and will include recommendations for the HFTG.

4.3.4. Regulatory Application

Regulation 4.01 of the AEPR 1997 does not apply to undertakings beyond the civil side of the airport. Consequently, any action by Airservices' ARFFS on the military side of the airport does not result in non-compliance with regulation 4.01. However, on the civil side of the airport, tenants and licensees have a range of obligations under the AEPR. These include obligations to maintain appropriate monitoring and reporting systems in relation to certain environmental matters under regulation 6.05.

It is clear from the discussion above (**section 4.3.3**) that recommendations made in Airservices internal environmental assurance reports were not followed up. The appropriate maintenance of its environmental management system (EMS) was clearly not undertaken. Non-compliance of Airservices' EMS was not communicated to the Department and for 8 years the station and Airservices' Corporate area were aware that testing should have been undertaken on the water released to storm water, however this was not actioned. The failure to complete the recommendations provided in the BECA report and the internal environmental assurance reports indicates that the EMS did not comply with ISO 14001 and was ineffective in preventing potentially adverse environmental impacts from occurring.

Part of the responsibility for checking an airport tenant's EMS falls to Darwin International Airport Pty Ltd (DIA), as it is a requirement of regulation 6.02 of the AEPR for the airport lessee company to monitor the environmental condition of the airport, including taking account of any information or reports provided by sublessees and licensees under regulation 6.05(1)(b) of the AEPR. To address the monitoring of tenant operations, operators of federally-leased airports undertake annual tenant inspections to check on their tenants' Operational Environmental Management Plans (OEMP), Environmental Management Plans (EMP) and management strategies. DIA commenced undertaking tenant audits in the first half of 2017. Non-conformances in Airservices' EMS may have been identified sooner by DIA if the tenant audits system had been introduced earlier.

The requirement for commencing tenant audits was raised by the AEO with DIA in early 2016.

4.3.5. Outcome and Recommendations

Regulation 4.01 of the AEPR does not apply to the conduct which is the subject of this allegation, as the alleged undertaking took place at the HFTG, which is situated on the military side of the airport.

Nevertheless, the investigation confirmed the *ad hoc* release of waste water from the HFTG to storm water. However, in December 2017 the valve handles for release to storm water at the HFTG on the military side and the fire station training ground on the civil side of the airport were removed, thus preventing the release of waste water to storm water at both training grounds.

The investigation found that failure to act on recommendations provided in the BECA reports and Airservices' internal environmental assurance reports indicated that Airservices' EMS did not comply with ISO 14001 and was ineffective in preventing potentially adverse environmental impacts from occurring.

It is recommended that Airservices:

- undertake external ISO 14001 audits of its EMS;
- undertake audits to check that all recommendations/actions provided in the internal environmental assurance reports are completed in a timely manner;
- undertake an audit of its fire station's compliance with waste removal procedures;
- develop a communication strategy to advise all relevant stakeholders when a non-compliance of the EMS has the potential to result in an adverse environmental impact; and

- continue ongoing collaboration with Defence to regularly review the environmental risks for the release of waste water from the HFTG to ensure compliance with national standards and adequate protection of receiving environments.

It is noted that following the completion of a DSI, Defence is developing a PFAS Area Management Plan for RAAF Base Darwin which will include recommendations for managing PFAS at the HFTG.

4.4. ALLEGATION 3: WASTE WATER FROM THE WASH DOWN BAY AREA WAS RELEASED TO SEWER

4.4.1. Allegation

The complainant claimed that from 2015, Airservices transported effluent from the HFTG treated pits to the station for disposal to sewer. The procedure required staff to pump treated effluent into totes for transport via trailer to the station and discharge to the station wash down bay for disposal to sewer.

4.4.2. Lines of Evidence

1. It was detailed during interviews with Airservices' staff (**Airservices Interview no. 3, Appendix 5**) that;

   "all water that is collected in the HFTG pad is first of all allowed to evaporate."

2. It was clarified by a current Airservices' employee (**Airservices Interview no. 5**, **Appendix 5**) that:

   "all waste training water is drained into the underground storage tanks and is transported back to the wash bay area to be disposed to sewer."

   "The decanting method occurred from 2010-2017."

3. The interviews with current Airservices' employees also confirmed the process of decanting waste water into a tote and transporting it to the station wash bay area.

4. Airservices Internal Environmental Assurance Report findings dated 6.08.2010:

   "There is no regular testing of water output quality from either separator and thus the effectiveness of the equipment and whether any contaminants are being passed to sewer or storm water are unknown.

   Recommendations:

   - *undertake a risk screening assessment;*
   - *write to Darwin Airport to determine if Airservices EMS is adequate to cover the requirements of the Airport Environment Management Strategy."*

5. Darwin ARFFS station Local Instruction dated 22.12.2010 (**Appendix 7**):

   "All holding tanks are to be emptied and treated by WasteMaster."

6. Airservices' Internal Audits of March 2013:

   "*Station Hot Fire Training Ground:*

At the hot fire training ground, located adjacent to Darwin ARFF station, small amounts of foam were observed floating on top of standing rainwater within the bund (Plate 8). The foam was contained within the bund but would be released to the oil/water separator system during operation of the training ground. This may need further investigation as to determine the state of contamination at the pad and at what levels foam may be leaching from the pad.

Recommendations:

3.1 Water quality monitoring to be undertaken at:

the outlet from station treatment system to Darwin Airport's sewer connection."

7. Airservices' Internal Environmental Assurance Report findings of September 2015:

"*Review of past actions*

Water quality monitoring to be undertaken at:

the outlet from station treatment system to Darwin Airport's sewer connection [stated as completed].

Findings

DN ARFF are covered under Darwin Airports TWA but there is no formal acknowledgement of this or formal testing conducted of water going to Darwin Airport's sewer connection.

Recommendations:

BECA to continue process to register Darwin ARFF's sewer discharges to obtain coverage under DIA's TWA."

8. BECA Site Visit Report no DN-APT-SSR-001 Report dated 25.09.2015 (**Appendix 9**):

"*The trade waste in the collection tank is pumped through a sepa type coalescing plate separator. The effluent is collected by a treated effluent tank before being pumped to the airport sewage system. No formal agreement between Airservices & Power Water via Darwin International Airport."*

The BECA 2015 report however contains an information sheet from DIA that highlights the requirements of the trade waste agreement. The report states:

"that all constituent measured with specific limits in the TWA were within the DIA sewer admission limits. There is a blanket clause in the TWA for 'other substances' which have a limit of 1ug/L, for which PFOS (Fire station and HFTG) and other fluorosurfactants (HFTG) were reported as exceeding this limit."

9. Env-Guide-0021 Water Quality Monitoring Guidelines for Wastewater and Rainfall Runoff dated November 2016 (**Appendix 8**):

"*no storm water runoff should be released to sewer."*

10. CIRRIS incident OCC-0007121 dated 4.09.2017 (**Appendix 10, Table 16**):

Large Mock Up (LMU)

"*We were conducting a training exercise when foam was produced from one of the vehicles in the exercise. The nearside outlet through a foam making branch. Immediately shut the branch and shut down the pump. Under run the hose into the bunded pad, returned to*

station and parked the vehicle in the wash down bay which has a separator and vehicle was flushed out. Waste water removed from LMU Cleanaway."

- AEO was informed of event by the DIA Environmental Manager. AEO requested evidence be provided to demonstrate that the wash bay area is connected to sewer. DIA notified NT Power and Water Corporation of the incident who advised that PFOS and PFOA were not on the Trade Waste Certificate.

Result:

- Airservices required to store wastes from incidents in the retention dam and arrange for certified waste disposal contractor to take the waste.
- This coincides with the waste certificates dated 22.11.2017.

11. BECA Site Visit Report no. AU1-2435498-3 dated 15.12.2017 (**Appendix 9**):

Darwin ARFFS station - high PFOS/PFOA concentrations identified from sampling of the station sewer pumping pit. Levels are indicating concentrations released to sewer.

Table 5: BECA report no. AU1-2435498-3 (15.12.2017) - Darwin ARFFS station water sample taken from sewer pumping pit

Analyte	Result (µg/L)	ANZECC - F 99% (µg/L)
PFOS	0.14	0.00023
PFOA	0.02	19
Sum of PFAS	0.45	N/A

The report stated that:

"the current process for the disposing of waste water was to transport the waste to the wash down bay area and release it to sewer. The recommendation was:

Progress discussions with DIA to put a formal agreement in place to confirm Airservices' trade waste obligations under the DIA trade waste agreement with Power and Water."

12. BECA Darwin ARFF Drainage study 2.02.2018 (**Appendix 9**):

"*It was identified that there is no formal agreement in place with Darwin International Airport (DIA) for the discharge of trade waste to sewer, which is required under the terms of DIA's agreement.*

Clarity was sought over potentially contaminated waste streams that are generated at Airservices facility and where these sources discharge."

BECA was asked to investigate the sources and discharge of potentially contaminated materials to aid in discussions with DIA.

- The report identified the following areas as sources for discharge to sewer and storm water:
  - ARFF station wash bay treatment in ground interceptor released to sewer pumping station - water sampling after a truck wash taken from the interceptor outlet chamber: PFOS 0.22µg/L, PFOS and PFHxs 0.22µg/L and PFOA 0.03 µg/L.
  - A second coalescing plate separator was identified in the EVT workshop.

- EVT non greasy waste; treatment coalescing plate separator; released to sewer pumping station or storm water grassy swale; ARFF station EVT Separator water sample results showed levels of PFOS 15.3 µg/L, PFOS and PFHxs 19.8 µg/L and PFOA 4.75 µg/L.
- When taking the samples, a grey paint was observed in the EVT interceptor waste pit.
- The EVT coalescent plate showed long chain hydrocarbon exceedances.
- EVT workshop greasy waste – picked up by third party for waste removal.
- Hand Extinguisher training area - no treatment, concrete runoff to surrounding area sump drains are blanked off.
- Hose drying rack straight to sewer pumping station - no treatment.
- Sewer pumping station water sampling results: PFOS 0.14 µg/L, PFOS and PFHxs 0.14 µg/L, PFOA 0.02 µg/L and TPH C10-C36 1620µg/L.

Conclusions:

- The levels of PFOS and PFOA in the wash bay area were below criteria guidelines.
- The high level of long chain hydrocarbons may have been the result of the paint emulsifying remnant grease and oils on the coalescing plate.
- The levels of PFOS and PFOA in the EVT interceptor is a result of legacy contamination of the pits and other internal surfaces leaching into accumulated waste water, and/or from mechanical parts washed in the workshop that may have had contact with AFFF.
- When being discharged to sewer, the more contaminated trade waste streams (from the EVT workshop/separator or the HFTG) present a short term risk of discharge of PFAS, oil, grease and hydrocarbons to sewer.
- The trade waste streams do not appear to have a significant lasting effect (e.g. residual PFAS that results in levels above the adopted guideline limits) on the trade waste discharged at other times.

13. Airservices' Internal Audits findings dated 16.04.2018:

"Documentation and Records Review - Environmental records
Site drawings in the BECA September 2016 report were inaccurate and requires review and update.

Observation
32. Update Site Drawings (sewer, waste water system and storm water system) to reflect current infrastructure.

Recommendation
A3.4: Review and update asset layout (sewer, waste water system and storm water system) plan to ensure it is correctly presented in the environmental reports (32)).

No current registration for ARFFS station under DIA's TWA (although this process is in train).

Observation
36. Darwin ARFFS and BECA to continue discussions with DIA to register Darwin ARFFS onto the blanket TWA.

Recommendation
A3.3: Discuss and agree on the water quality testing to register Darwin ARFFS onto the blanket TWA (36), and any annual environmental status reporting requirement with DIA (43)."

14. ARFFS HFTG Work Orders (**Appendix 6**) – work orders for servicing of environmental equipment including emptying of holding tanks were requested by the AEO as part of this investigation:

    - Maintenance certificates for 15.12.2015 – 22.11.2017 were not provided. An interviewed Airservices employee (**Airservices Interview no. 4, Appendix 5**) stated that in 2014, an accelerated change occurred and all maintenance went through property.
    - Work Orders for cleaning out pits or maintenance of separator, which also involves pumping out of pits, not provided for the period Dec 2009 – 15.08.2011.
    - Work Order no. 346618 provided for the cleaning out of the irrigation tank on 26.08.2009.
    - Work Order no. 273999 provided for priming of the irrigation pump on 10.09.2008.

15. Dates of completion for ARFFS HFTG waste certificates provided to the AEO (**Appendix 6**):

    3.11.2005, 20.12.2006, 9.07.2008, 23.04.2012, 8.09.2014, 22.11.2017, 26.02.2018 and 16.03.2018.

    Note: ARFFS provided a copy of Airservices' email dated 20.06.2006 clarifying that NT EPA does not require waste tracking for listed wastes. If the wastes are to be transported interstate, stations must retain certificates.

16. Dates of waste certificates for Darwin ARFFS station provided to the AEO:

    19.01.01, 18.10.01, 27.09.2002, 9.07.2008, 26.08.09, 16.08.2010, 7.09.2010, 17.09.2010, 28.04.2011, 23.02.2017, 22.09.2017 and 12.03.2018.

    Note: There is a gap in the waste certificates for 28.04.2011 – 23.02.2017.

    Note: ARFFS provided a copy of Airservices' email dated 20.06.2006, clarifying that NT EPA does not require waste tracking for listed wastes. If the wastes are to be transported interstate, stations must retain certificates.

17. AEO was provided with the updated Darwin ARFFS Local Instruction for flushing out of vehicles post foam incidents (**Appendix 7**):

    The Local Instruction prescribes that the flushing out of vehicles are to be undertaken at the LMU training pad and not at the station wash bay area. This was amended in response to the requirements of NT Power and Water Corporation to ensure that the process of discharging effluent to sewer ceased.

4.4.3. Discussion

The complainant alleges that commencing from 2015, waste waters were discharged to sewer by Darwin ARFFS personnel without the approval of NT Power and Water Corporation.

During interviews with the AEO, Airservices' staff confirmed that, from approximately 2010 until September 2017, treated waste waters (effluent) were collected from the HFTG and transported via totes to the vehicle wash bay for disposal to sewer.

Airservices have periodically reviewed the environmental management of the Darwin ARFFS facility via environmental audits and assessments. These were conducted by Airservices' Officers

and consultants in 2010, 2013 and 2015. Each of the resulting reports discuss the issue of waste removal and discharge of wastes to sewer and go on to make recommendations.

In the 2010 environmental audit and assurance report, it was noted that:

"There is no regular testing of water output quality from either separator and thus the effectiveness of the equipment and whether any contaminates are being passed to sewer or storm water are unknown.

Changes to the Darwin ARFF on-ground activities are not being risk assessed in accordance with AA-REF-ENV-0010."

The report recognised that "*failure to adequately manage and monitor infrastructure and output from ARFF activities may result in environmental damage to surrounding areas and failure to recognise potential for damage in a timely manner"* and identified *"7 D class findings, most of which relate to waste management, awareness of local legal requirements, monitoring processes and minor management issues."* The report went on to advise that "*actions have been discussed and will be in place to address the findings by 30 June 2011".*

The 2013 Airservices' Internal Environmental Assurance Report discusses trade waste permits for disposal to sewer and states "*DN ARFF are covered under Darwin Airports TWA but there is no formal acknowledgement of this and no formal testing conducted of water going to Darwin Airport's sewer connection"* and recommends that as a priority item, *"water monitoring be undertaken at the outlet from station treatment system to Darwin Airport's sewer system."*

The 2015 Environmental Assessment report notes in the documentation and records section that Darwin ARFFS are not registered to discharge to DIA's sewer system and recommends that BECA continue the process of registering Darwin ARFFS sewer discharges to obtain coverage under DIA's Trade Waste Agreement (TWA). This statement is in conflict with the findings of the 2013 assurance report which stated that Darwin ARFFS was covered under DIA's TWA.

The report concludes that "*a number of systemic non compliances continue to be issues at the Darwin ARFF station, particularly the update and improvements* [of] *trade waste facilities. It is recommended that ARFF liaises with National Property to reach a suitable long term solution for these issues".*

In response to these recommendations, monitoring was conducted on behalf of Airservices by BECA in 2015, 2016, 2017 and 2018. The 2015 report correctly indicates that the mechanical workshop, vehicle wash bay and fire hose drying rack discharge to sewer via a silt trap, but incorrectly describes waste water from the HFTG as captured in an underground storage tank and pumped to sewer via a coalescing plate interceptor. Airservices' staff acknowledged in interviews with the AEO that between 2010 and 2017, waste water from the HFTG was pumped into totes for transport to the vehicle wash bay for eventual discharge to sewer. The report references correspondence between Airservices, DIA and the Fire Station as recognising that ARFFS were not included on DIA's TWA. It goes on to discuss the result of sampling for PFAS at the HFTG and vehicle wash bay and the potential impact that this might have on any application for a TWA. The concentrations recorded at the HFTG were PFOS 256µg/L and PFOA 87.7µg/L, and at the vehicle wash bay were PFOS 1.44µg/L and PFOA 0.077µg/L.

It states: "*that all constituent measured with specific limits in the TWA were within the DIA sewer admission limits. There is a blanket clause in the TWA for 'other substances' which have a limit of 1ug/L, for which PFOS (Fire station and HFTG) and other fluorosurfactants (HFTG) were in exceedances."*

It is apparent from these results that Airservices were or should have been aware in 2015, that discharge to sewer of water from the Darwin ARFFS station did not meet the requirements for the TWA. Airservices' staff informed that discharge of HFTG and other waste waters to sewer continued until ceased in 2017 as a result of a foam spill occurring on the HFTG pad (reported in CIRRIS incident OCC-0007121). Notification of that incident to the AEO via DIA, led to DIA notifying NT Power and Water Corporation, which advised that discharge of PFAS and PFOA was not on the Trade Waste License. Subsequently, DIA notified Darwin ARFFS that discharge of its waste waters to sewer was to cease until an assessment of the risk to sewer was undertaken.

The required risk assessment was completed as part of the BECA 2018 report.

The report concluded;

- When being discharged to sewer the more contaminated trade waste streams (from the EVT workshop/separator or the HFTG) present a short term risk of discharge of PFAS, oil, grease and hydrocarbons to sewer.
- The trade waste streams do not appear to have a significant lasting effect (e.g. residual PFAS that results in levels above the adopted guideline limits) on the trade waste discharged at other times.

The report does not provide any recommendations to the station as to how the short term risk could be avoided or if it is acceptable to continue following the same process. It did not provide any further recommendations for discussion with DIA.

It should be noted that the 2015 results were not provided to the AEO or DIA until requested as part of this investigation, and that these results should have been provided within 14 days if levels exceeded the limits within the AEPR (regulation 6.04) and at a minimum, included in the airport's Annual Environment Report.

Additionally, the Darwin ARFFS Local Instruction (22.12.2010) prescribes that waste should be removed by a licensed contractor, however no waste certificates have been provided for the years 2010, 2011, 2013, 2015 and 2016 for the HFTG. The lack of evidence to indicate disposal via a licensed contractor during this period suggests discharge to sewer and/or discharge to storm water may have been the likely waste disposal methods used.

It was noted in an interview with an Airservices' personnel that the carting of waste to the wash bay was only done occasionally when there was a lot of training and the pits were full. The common method used was to let the training water evaporate.

Based upon admission by Airservices' employees and other lines of evidence above, Allegation 3 is substantiated. However, it is noted the practice of discharging to sewer ceased in September 2017, with all waste being subsequently diverted to a waste disposal contractor.

4.4.4. Regulatory Application

The release of waste water to sewer and exceedance of the trade waste license requirements do not constitute water pollution for the purposes of the AEPR, as the definition of water pollution under regulation 2.02(3)(e) of the AEPR specifically excludes "water in a system for the passage of sewage". It is covered by the NT Power and Water Corporation's requirements under its trade waste agreement with DIA and is a matter between these two parties.

4.4.5. Outcome and Recommendations

Based upon admission by Airservices' employees and other lines of evidence above, Allegation 3 is substantiated, however it does not contravene regulation 4.01 of the AEPR. The practice of discharging to sewer ceased in September 2017 with all waste being subsequently diverted to a waste disposal contractor.

It is recommended Airservices engage with DIA to ensure that Airservices fully complies with any requirements by NT Power and Water Corporation prior to recommencing any discharge to sewer.

The 2017 Airport Environment Strategy (AES) commits DIA to:

"continue to monitor trade waste agreement discharge and maintain a register of the trade waste agreement."

In order to ensure compliance with the AES, it is recommended DIA conduct an audit of Airservices' ARFFS and all other tenant operations that discharge to sewer via the airport's trade waste agreement with NT Power and Water Corporation. It is recommended a copy of the resulting report be forwarded to the AEO and a summary included in the airport's Annual Environment Report.

4.5. ALLEGATION 4: WASTE WATER FROM THE STATION RETENTION DAM WAS RELEASED TO STORM WATER (POST-SEPTEMBER 2017)

4.5.1. Allegation

The complainant alleges that Darwin ARFFS deliberately discharged contaminated waste waters from the station retention dam to stormwater after being advised to cease discharging waste water to sewer in September 2017.

4.5.2. Lines of Evidence

1. In an interview with the AEO, an Airservices' Senior Operational Standards specialist (**Airservices Interview no. 1, Appendix 5**) stated: *"2010 training with foam was stopped"*.

2. An email with the subject 'environmental abuse 8' (**Appendix 4**) was sent from the complainant to the Department on 23.02.2018. The email had an attachment which was a google map of the Darwin ARFFS station with a written description.

   The written description by the complainant consists of the following:

   - the location of the retention dam on the civilian side of the airport;

- the location of the control room and drainage taps;
- effluent is drained from the dam to stormwater and to some other location for processing; and
- location of the large drain north of the station.

The description further details the daily testing of tenders on Rescue Road with foam incidents.

3. The complainant forwarded an email from the Darwin Operations Manager dated 15.09.2017 with the subject 'Foam'. The email had an attachment labelled 'Vehicle after foam use procedures LI'.

   The complainant explained that a waste provider would finally be contracted to remove all waste water from the retention pond. He said that after the email was sent, an instruction was verbally given by the operations manager to continue with the 'cover ups'.

   The email from the Darwin Operations Manager provided a procedure for vehicle washout after foam use. The fourth step in the procedure instructed that water contained in the temporary dam was to be removed by a certified waste disposal facility.

4. As Work Orders for the Darwin ARFFS station were not provided for the period 20.07.2015 – 24.02.2017, no record is available to confirm separator maintenance, pump out of pit drains or cleaning of tanks during this period.

   Maintenance certificates were provided for biannual servicing of these facilities prior to 20.07.2015.

   It was stated in **Airservices Interview no. 4** (**Appendix 5**) that accelerated change occurred in 2015 and all maintenance work went through property. The AEO requested maintenance certificates for the gaps as part of the investigation.

5. Waste certificates were provided for the Darwin ARFFS station training ground for the following dates (**Appendix 6, Table 15**):

   - 19.01.01, 18.10.01, 27.09.2002, 9.07.2008, 26.08.09, 17.09.2010, 16.08.2010. 7.09.2010, 28.04.2011, 23.02.2017, 22.09.2017 and 12.03.2018.
   - No waste certificates were provided for the period 28.04.2011 – 23.02.2017.

   Note: Darwin ARFFS provided a copy of an Airservices email dated 20.06.2006 clarifying that the NT authorities do not require waste tracking for listed wastes. If the wastes are to be transported interstate, stations must retain certificates.

6. Waste certificates identified in Airservices' Internal Environmental Assurance Report 2015 were not provided for 8.09.2014 and 5.06.2015.

7. Darwin ARFFS Local Instruction dated 4.07.2010 (**Appendix 7**):

   "The water flows from the retention pond into a pipe that has two valves. These valves direct the water either into storm water as waste or to be processed. The valve positions (open or closed) dictate the flow direction:

   Valve 1 open, Valve 2 closed → releases water to storm water (no processing);

   Valve 1 closed, Valve 2 open → directs water into the processing system.

   When water from the sump is pumped into the filter system, either of the following will occur:

- *Processed water is directed into the storm water drains.*
- *Processed water is directed into the sewerage system.*

Notes:

1. The sump for the processing system has high and low water level switches that turn the processing filter pump on and off (as required).

2. The 'red flag' must be flown high on the fence when the valves on the water processing facility are set to 'storm water waste'.

The following table details the valve positions required, depending on the training facility being used:

When:	***Valve Positions***
The training facility is not in use (rainwater outflow)	*Valve 1 open, Valve 2 closed.*
Liquid petroleum gas is being used on the training facility	*Note: The filter pump must be switched 'off'.*
Liquid hydrocarbon is being used on the training facility	*1. Valve 1 closed, Valve 2 open.* *2. Filter pump from the sump switched 'on'.* *3. Valve 3 closed, Valve 4 open (this directs waste water to the sewerage).*

8. Airservices' Internal Audit findings dated 6.08.2010:

"there is no regular testing of water output quality from either separator and thus the effectiveness of the equipment and whether any contaminants are being passed to sewer or storm water are unknown.

Recommendations:

- *undertake a risk screening assessment;*
- *issue Memo and Task Request to require the inclusion of risk screening in all Local Instructions for reference by station;*
- *write to Darwin Airport to determine if Airservices EMS is adequate to cover the requirements of the Airport Environment Management Strategy."*

9. Airservices' Internal Audit findings dated 5.02.2013:

"*At the training ground, located adjacent to Darwin ARFF station, small amounts of foam were observed floating on top of standing rainwater within the bund (plate 8). The foam was contained within the bund but would be released to the oil/water separator system during operation of the training ground. This may need further investigation as to determine the state of contamination at the pad and at what levels foam may be leaching from the pad.*

Recommendations:

a. Water quality monitoring to be undertaken at:
the outlet from station treatment system to Darwin Airport's sewer connection;

b. Relevant licenses (or copies) for waste removal contractors need to be held on base;

c. *No mention of water quality monitoring at the storm water release point."*

10. Airservices' Internal Audit dated 22.09.2015:

"Review of past actions

Water quality monitoring to be undertaken at: the outlet from station treatment system to Darwin Airport's sewer connection" (stated as completed).

No evidence was provided to show completion of this action.

11. BECA Site Visit Report no. DN-APT-SSR-001 dated 25.09.2015 (**Appendix 9**):

Sample date: 30.03.2015 - Project #9168 Trade Waste Agreement Management

"Darwin ARFF Drill ground

All waste water is drained into the evaporation pond. The pond does not show any loss of integrity. The pond can be drained to stormwater or the separator system using manual valves.

An instruction panel provides direction for ARFF crew as follows:

- *Rainfall and training waste water from LPG exercises is to be directed to stormwater from the evaporation pond;*
- *Training waste water from petrol and kerosene based exercises is to be directed to stormwater via separator;*
- *Training waste water when foam is in use is to be directed to sewer via the separator."*

12. BECA Site Visit Report no. DN-APT-SSR-001 dated 25.09.2015 (**Appendix 9**):

Sample date: 30.03.2015 - Project #9168 Trade Waste Agreement Management

"*Darwin ARFF Drill ground*

Training waste water when foam is in use is to be directed to sewer via the separator. Water sample was taken from the wash down bay pit.

Table 6: BECA report no. DN-APT-SSR-001 (25.09.2015) - Darwin ARFFS station sample taken from wash down bay pit

Analyte	Unit	Results	DIA TWA
C6-C9 + C10-C36	µg/L	<70	30 000
PFOS	µg/L	1.44	0.3
PFOA	µg/L	0.077	0.3
6:2Fts	µg/L	<0.10	0.05
8:2FtS	µg/L	0.25	0.05

A sample was taken from the hot fire training ground separator after three days of rainfall.

Table 7: BECA report DN-APT SSR-001 (25.09.2015) - Hot Fire Training Ground separator water sample

Analyte	Unit	Results	DIA TWA
C6-C9 + C10-C36	µg /L	<70	30 000

PFOS	µg/L	256	0.3
PFOA	µg/L	87.7	0.3
6:2Fts	µg/L	18.1	0.05
8:2FtS	µg/L	39.6	0.05

Actions:

Remove the evaporation pond and separator operating instructions and replace with a direction on how to either hold water in the pond to evaporate or direct flow to sewer by the separator only. The instruction should note that discharge to stormwater should not occur.

Note the presence of high level PFC's is a risk to Airservices, particularly in light of recent media attention drawn to the Department of Defence.

Review current ARFF practices for handling and use of Ansulite AFFF (including training, EVT workshop and testing) to determine if there are activities which might routinely or accidentally result in the discharge of dilute or concentrated Ansulite to sewer or the environment.

Consider performing a wider study on the levels of contamination at various points within the trade waste handling system, and the surrounding local environment with a view to identifying the risk of migration off-site and forming a plan to alter activities to reduce the risk monitor or remediate. This may include:

Measuring PFC's in stormwater runoff from the pad to determine if stormwater can be handled differently.

Comparing PFC results directly sourced from the pad with stagnant water in wastewater storage tanks, then consider bypassing or replacing highly contaminated equipment."

13. Env-Guide-0021 dated 14.11.2016, Water Quality Monitoring Guidelines for Wastewater and Rainfall Runoff (**Appendix 9**):

    The procedure states:

    "If there is a reasonable likelihood that an Airservices activity and the runoff is not being processed through a wastewater treatment system before entering the environment, a contamination assessment is required. The resultant assessment report will provide recommended management measures to be implemented if required."

14. CIRRIS incident OCC-0007121 dated 4.09.2017 for Large Mock Up (LMU) site (**Appendix 10, Table 16**):

    "*We were conducting a training exercise when foam was produced from one of the vehicles in the exercise. The nearside outlet through a foam making branch. Immediately shut the branch and shut down the pump. Under run the hose into the bunded pad, returned to station and parked the vehicle in the wash down bay which has a separator and vehicle was flushed out. Waste water removed from LMU Cleanaway."*

    The event coincides with waste certificate dated 22.11.2017.

    The AEO was informed of the event by DIA's environment manager. The AEO requested that evidence be provided to demonstrate that the wash bay area was connected to sewer. DIA notified NT Power and Water Corporation of the incident who advised that PFOS and PFOA were not on the trade waste certificate. Airservices were advised and it amended procedures

to store all wastes from incidents in the retention dam and arranged for collection by a certified waste disposal contractor.

15. Darwin ARFFS Local Instruction dated 15.10.2017 (**Appendix 7**) describes when a truck has a foam incident, it is to be washed out at the training ground and the waste water is to be stored in the retention dam and then disposed of by a licensed waste facility.

16. BECA Site Visit Report no AU1-2435498-3 dated 15.12.2017 (**Appendix 9**):

    Sample date: 15.09.2017
    "Darwin ARFF Drill ground
    Wastewater discharge is processed and sent to sewer. Sample taken from separator weir."

    Table 8: BECA report AU1-2435548-3 (15.12.2017) - Darwin ARFFS station water sample taken from separator weir

Analyte	Results (µg/l)	ANZECC - F 99% (µg/l)
PFOS	0.14	0.00023
PFOA	0.02	19
Sum of PFAS	0.45	N/A

17. BECA Darwin ARFFS Drainage study 2.02.2018 (**Appendix 9**):

    "*It was identified that there is no formal agreement in place with Darwin International Airport (DIA) for the discharge of trade waste to sewer, which is required under the terms of DIA's agreement.*

    Clarity was sought over potentially contaminated waste streams that are generated at Airservices facility and where these sources discharge.

    BECA was asked to investigate the sources and discharge of potentially contaminated materials to aid in discussions with DIA."

- The report identified the following areas as sources for discharge to sewer and storm water:
  - HFTG (dry season) – training waste water and storm water treatment – coalescing plate separator. The report summarised that in the dry season waste water was treated and taken into Intermediate Bulk Containers (IBCs) to the ARFFS station to be discharged into the wash bay. Waste water sample taken from effluent pad showed the following levels: PFOS 1.3 µg/L, PFOS + PFHxs 1.4 µg/L, PFOA 64.2 µg/L and TPH C10-C36 650 µg/L.
  - HFTG (wet season) – storm water not treated and released onto grass swale. A storm water sample was taken from a simulated wet season scenario which showed: PFOS 86.2µg/L, PFOS + PFHxs 103 µg/L, PFOA 1.31 µg/L and TPH C10-C36 320 µg/L.
  - ARFFS station wash bay treatment in-ground interceptor released to sewer pumping station.
  - EVT non greasy waste, treatment coalescing plate separator, released to sewer pumping station or storm water grassy swale: ARFFS station EVT Separator water sample results showed levels of PFOS 15.3 µg/L, PFOS + PFHxs 19.8 µg/L, PFOA 4.75 µg/L and TPH C10-C36 107,000 µg/L.

- EVT workshop greasy waste – picked up by third party for waste removal.
- Smoke hut – released to evaporation pond and can be:
  - discharged to swale,
  - treated with coalescent plate and discharged to swale;
  - treated with coalescing plate and discharged to sewer.
- Hand Extinguisher training area – no treatment, concrete runoff to surrounding area sump drains are blanked off.
- Rainfall into evaporation pond , allowed to evaporate or discharge three ways:
  - discharged to swale,
  - treated with coalescent plate and discharged to swale;
  - treated with coalescing plate and discharged to sewer
- Hose drying rack – discharged straight to sewer pumping station, no treatment.
- Sewer pumping station water sampling results: PFOS 0.14 µg/L, PFOS + PFHxs 0.14 µg/L, PFOA 0.02 µg/L and TPH C10-C36 1620 µg/L.

18. Airservices' Internal Audit findings dated 16.04.2018:

"*Site wastewater containment infrastructure and associated wastewater treatment plant (WWTP) at the station and LMU, is not effective in containing or removing residual PFAS from the wastewater stream.*

It is recognised that station infrastructure designed around 1990 is not capable of delivering contemporary environmental standards.

Noted that drill ground wastewater in the post-treatment holding tank is contained for licensed waste disposal."

Recommendations:

"23. ARFFS engineering and property services to inspect the integrity of the bund and where require undertake necessary repairs to the training pad surfaces.

Action

A1.2: Investigate and where required, commission repairs to be carried out on the training pad surfaces and bunds.

24. Undertake an investigation and risk assessment into the station's wastewater infrastructure, which will inform mitigation strategies and possible infrastructure improvements to achieve contemporary standards of environmental management.

Action

A3.1: Undertake an investigation and risk assessment into the station's wastewater infrastructure, which will inform mitigation strategies and possible infrastructure improvements to achieve contemporary standards of environmental management (24). Ensure vehicle testing is included in this review (26).

16. Regular testing of the standing water within the pond should be carried out in accordance with ENV-GUIDE-0021.

No recommendation provided for above observation.

18. ARFFS engineering / property to undertake necessary testing to confirm the integrity of the evaporation pond wall and confirm if it is made of impervious material.

Action

A1.4: Undertake necessary testing to confirm the integrity of the evaporation pond wall and confirm if it is made of impervious material (18).

19. ARFFS to ensure any discharge to the environment can only occur following monitoring in accordance with ENV-GUIDE-0021.

No action provided for this recommendation.

20. Local Instructions should be updated to reflect site practices for management of wastewater including clarification of default position of the valve and the flag during training and non-training times and detailed procedures for management of waste/storm water during dry/wet season.

Action

A4.2 Update Local Instructions to:

reflect site practices for management of wastewater including clarification of default position of the valve and the flag during training and non-training times and detailed procedures for management of waste/storm water during dry/wet season (20).

24. Undertake an investigation and risk assessment into the station's wastewater infrastructure, which will inform mitigation strategies and possible infrastructure improvements to achieve contemporary standards of environmental management.

Action

A3.1: Undertake an investigation and risk assessment into the station's wastewater infrastructure, which will inform mitigation strategies and possible infrastructure improvements to achieve contemporary standards of environmental management (24). Ensure vehicle testing is included in this review (26).

A2.10: Ensure waste transport dockets include details of sites where waste is collected from, as well as where the waste is delivered to, and waste contractors licenses are on file and up to date (37 & 38).

No review or follow up of past actions were provided in the report.

19. **Airservices Interview no. 5** (**Appendix 5**) dated 05.2018 stated:

"*water was stopped being released to stormwater at the end of 2017."*

4.5.3. Discussion

The complainant alleges that Darwin ARFFS deliberately discharged contaminated waste water to stormwater after being advised to cease discharging waste water to sewer in September 2017. In support of his complaint, the complainant alleges that he was verbally directed by the ARFFS Operations Manager to "continue with the cover-ups" and provided no other evidence or supporting information for this allegation.

Following CIRRIS incident report no. OCC-0007121 dated 4.09.2017, accidental discharge of foam during training, the contents of the fire tender was discharged to the station wash bay for release to sewer. This incident was reported to DIA who reported it to NT Power and Water Corporation, resulting in its advice that discharge of waters contaminated with PFOS or PFOA was not approved in the Trade Waste Agreement and the activity was to cease. These events are supported by an email chain provided by the complainant (**Appendix 4)**. The email chain includes emails from Airservices' Senior Environment Specialist (5.09.2017), the Airport Environment Manager (5.09.2017) and the Darwin ARFFS Fire Commander (6.09.2017).

In response to DIA's advice that Darwin ARFFS should cease discharging waste water impacted by PFOS or PFOA, an email dated 15 September 2017 was circulated to ARFFS staff from Airservices' Darwin Operations Manager advising that the Darwin Local Instruction for actions following accidental foam discharge was to be updated and a copy of the relevant revisions were provided in an attachment (**Appendix 4**).

The revisions to the Local Instruction were:

"*Vehicle after foam use procedures*

After foam activation all vehicle outlets are to be flushed clean with water at the waste water retention pond at the rear of the station.

- *Before flushing ensure valves 1 and 2 at the water retention pond are closed.*
- *The Fire Station Manager is to be notified.*
- *Any use of foam is to be reported and recorded in accordance with ENV-001.*
- *The water that is contained in the temporary dam is to be removed by a certified waste disposal agency. The Property Manager is to be contacted to manage this process.*
- *DIA and the Airport Environment Officer are to be notified of any foam use. This should be facilitated through the DIA Airport Safety Officer."*

Waste certificates for the station training ground indicate that waste was picked up from the retention dam on the following dates:

19.01.01, 18.10.01, 27.09.2002, 9.07.2008, 26.08.09, 16.08.2010, 7.09.2010, 17.09.2010, 28.04.2011, 23.02.2017, 22.09.2017 and 12.03.2018.

Note: Darwin ARFFS local instructions limits the training on the station training ground to the dry season.

Waste certificates were not provided for the period 28.04.2011 – 23.02.2017. It is noted additional waste certificates are referenced in Airservices' periodic environmental audits but these were not provided to the AEO. Failure to retain waste certificates may be partially explained by an email from Airservices in 2006 advising the waste certificates were not required to be retained, provided the material was not intended to be transported interstate for final disposal. This advice was provided based upon the NT EPA guidelines adopted in 2006 for waste disposal which is still current.

It can be seen from the above that waste was periodically being collected from the retention dam, with collections occurring at the end of September 2017 and March 2018.

Prior to September 2017, management of the discharge from the retention dam was completed in accordance with Local Instruction dated 4.07.2010, which specifies that during the wet season, the storm water outlet is to be left open with no training allowed.

During training activities, the storm water outlet was left open when using LP gas, but when liquid hydrocarbon was to be utilised, the waste was diverted to the processor where it would then be treated and discharged to sewer.

Under the 2010 Local Instruction, training pads were to be thoroughly cleaned prior to commencement of the wet season with the waste to be collected by a licensed contractor. As the wet season starts in October, the 22.09.2017 waste certificate can be assumed to be the pre-wet season collection of cleaning waste and the March 2018 waste certificate is for emptying of the retention dam prior to the commencement of training activities.

It is noted in late 2017, Local Instructions were amended to remove discharge to storm water from the training pads or the retention dam as an option for disposal. This direction was enforced in December 2017 with the removal of the tap handle from the discharge valve to storm water at the station retention dam.

Based on the evidence collected in the investigation, the complainant's allegation that discharge to storm water continued after September 2017 is not substantiated.

While the complainant's allegation is not substantiated, it is known from Airservices' Environmental Audits in 2010, 2013 and 2015, and BECA 2015 and 2017 reports, that numerous recommendations were made for storm and sewer discharges to be analysed and risk assessments to be completed. These were not actioned or followed up by Airservices. Sampling that has been conducted has indicated that storm water discharges prior to September 2017 are likely to have been impacted by residual PFOS and PFOA from either training activities and/or residual leaching from concrete.

It is recommended that Airservices amend its Environmental Management Systems and procedures to ensure prompt and thorough follow-up of audit recommendations. It is further recommended that Airservices commission qualified consultants to review the Darwin ARFFS Local Instructions and other Airservices procedures to ensure that they support the systems and procedures detailed in the Airport Environment Strategy and comply with the requirements of the AEPR and other appropriate local and National Standards.

4.5.4. Regulatory Application

It is evident from the discussion above and Airservices' historic procedures that the stormwater valve has been left open at the training ground during the wet season to allow for all rainwater to flow directly out of the dam. It has also been observed that foam was present floating on top of pooled water from training that did not involve the use of foam. This observation indicates that the training infrastructure may be leaching foam residue (Airservices' Internal Environmental Assurance Report 2015). It is also evident from the above discussion, that Airservices had noted the risk of releasing rainwater to stormwater and had suggested testing the water before release (Airservices' Internal Environmental Assurance Report 2010), however this was not undertaken.

Prior to September 2017, the lines of evidence demonstrate that there were deliberate releases of rainfall water from the retention dam at the rear of the station to stormwater. Furthermore, the AEO's observation in March 2017 that training was occurring during the wet season at the HFTG on the military side of the airport raises concerns that training effluent may also have been discharged to stormwater at the fire station training ground on the civil side, as well as concerns of non-compliance with the Local Instruction requiring training to be conducted during the dry season only.

Allegation 4 is with regards to Darwin ARFFS personnel deliberately discharging contaminated waste waters to stormwater post-September 2017 after being instructed to cease this practice. The allegation was investigated against regulation 4.01 of the AEPR in relation to the general duty of an operator of an undertaking at federally-leased airports to take all reasonable and practicable measures to prevent the generation of pollution from the undertaking or, if prevention is not reasonable or practicable, to minimise the generation of pollution from the undertaking.

This obligation applies to the release of waters to storm water. Under regulation 2.02 of the AEPR, water pollution has occurred when waters contain a substance or organism:

a. that causes or is reasonably likely to cause, the physical, chemical or biological condition of the waters to be adversely affected; or

b. that causes, or is reasonably likely to cause, an adverse effect on beneficial use of the waters.

Adverse effect includes the effects described in Schedule 2 of the AEPR and the PFAS National Environmental Management Plan (NEMP). Beneficial use means a use conducive to public health, safety, aesthetic enjoyment or any other benefit.

The pathway and closeness of the source of contamination to the large storm water drain that exits the site and enters into Rapid Creek, as well as the contaminants high mobility, must all be considered when determining if an adverse effect has impacted the beneficial use of the waters.

Due to the likelihood that the fire training infrastructure is leaching and confirmation that the Darwin ARFFS have released rainwater to storm water since the training ground was established, additional investigations at the fire station site and training ground on the civilian side of the airport would be beneficial for delineating the extent of any potential contamination.

As highlighted above, the lines of evidence for this action have proven that the management system adopted by Airservices has failed to monitor the impact of the company's activities on the environment. Regulation 6.05 of the AEPR on duties of sublessees and licensees requires a company to maintain its own system of monitoring the environmental consequences of its activities. This does not appear to have occurred in this instance.

4.5.5. Outcome and Recommendations

Based on the evidence collected in the investigation, the complainant's allegation that discharge to storm water continued after September 2017 is not substantiated.

However, it is recommended that a risk assessment of the fire station training ground with regards to PFAS leaching be undertaken in accordance with the NEPM 2013 process and the PFAS NEMP to

determine the potential environmental risks of previous Airservices' activities at the training ground.

It would benefit Airservices to do an independent ISO 14001 external review of its environmental management system (EMS) and to align the EMS with ISO 14001. It is apparent that Airservices needs to modify its EMS to incorporate greater accountability and consistency in following up actions recommended by Airservices' Internal Environmental Assurance Reports and other audits or checks. All non-conformances reported in the internal environmental audits and reports should be followed up in a timely manner. These enhancements to Airservices' procedures should ensure systems are in place to regularly audit station Local Instructions and confirm that on ground actions by Airservices' stations comply with the Local Instructions and Airservices' national procedures.

It is recommended Airservices develop a communication strategy to advise all relevant stakeholders when a non-compliance of the EMS has the potential to result in an adverse environmental impact.

4.6. ALLEGATION 5: ACCIDENTAL DISCHARGES OF FOAM INTO THE ENVIRONMENT WERE NOT REPORTED THROUGH AIRSERVICES' STANDARD REPORTING PROCEDURES

4.6.1. Allegation

The complainant alleges that Darwin ARFFS personnel failed to report up to 30 incidents of accidental foam discharge during training or daily operational checks.

4.6.2. Summary of the complainant's emails detailing these allegations

In an email forwarded to the Department on 23.02.2018 with subject: *FW: foam. Including attachment Operational Bulletin* (**Appendix 4**), the complainant advised that an instruction was given to all stations to leave the foam switch on in all the tenders and described this procedure as "like telling a soldier or a constable of police to do their patrols with their weapon at instant or with the safety switch off".

The attachment includes three operational bulletins as described below:

- Operational Bulletin 15/006 dated 7.08.2015 clarifies that all foam valve switches are to be left in the on position.
- Operational Bulletin 15/007 dated 27.08.2015 advises that there have been a number of reported incidences where foam has entered the tanks of the MK8 and MK9 ULFV's and as a result of these incidences, the following mandatory action was put in place: *Ensure the hose reel discharge is always in the off position when not in use*.
- Operational Bulletin 16/004 dated 27.03.2016 provides instructions for staff on the operation of the foam valve switch for the purpose of conducting daily inspections and operating the vehicle pump during training exercises: *Foam valve switch on and hose reel switch off*.

In the complainant's email with subject: *FW Vehicle 3: foam in tank*, the complainant surmised that foam was produced from the incident described in the email referenced below.

Email from an Airservices' employee (position not supplied) to the Darwin ARFFS team on 9.08.2015 with the subject: *Vehicle 3 Foam in tank* clarified that foam was found in the T3 water tank possibly due to the hose reel switch being left on.

- Complainant email with subject: *FW FOAM SWITCHES FIRE VEHICLES* surmised:
  "August 2015, the instruction to change the procedure of the foam switch position came through just prior to this email. Safe to say this email was sent following another accidental discharge of foam."

- Email from the Darwin Fire Station Manager dated 10.08.2015 to all the Darwin ARFFS crew with the subject: *FOAM SWITCHES FIRE VEHICLES* stated:
  "As you are all aware it is NOW a requirement to have the foam switches on the vehicles in the ON position at all times.
  When water only is to be pumped the foam switch is to be turned to the OFF position.
  Over the weekend Tender 3 was found to possibly have foam in the water tank.
  On investigation it was found that the hose reel switch had been left in the ON position.
  As you all are aware when the pump is operated and the hose reel is in the ON position the excess pressure is vented into the water tank. If the foam valve is on then foam is induced into the water tank.
  Drivers/ Operators are to ENSURE that the hose reel on/ off switch is in the OFF position at all times when daily etc. inspections are completed and after training has been completed."

- Complainant email with subject: *FW Fire Vehicles and foam switches URGENT!!* stated:
  "*The below email stream relates to ways we can come up with to prevent accidental discharges of foam. In the starting email, the 'events' is reference to accidental discharges of foam. There has only been 2 accidental discharges reported via Airservices CIRRIS system. All of the other discharges, as many as 20-30 have been covered up."*

In support of his claim, the complainant included a quote from the Darwin Fire Station Operations Manager:

"*Fire Commanders are to engage with their teams to work out strategies and procedures to overcome this continually happening.*"

Email dated 22.08.2016 from the Darwin Fire Station Operations Manager to all Darwin ARFFS crew with the subject: *Fire Vehicles and foam switches URGENT!!* stated:

"In recent times Darwin has had a series of events where foam switches have been left in the wrong position for the operation being conducted. This includes

1) Foam Percentage switch being left on the wrong percentage.

2) Foam valve opening due to incorrect operating procedure following shutdown of hose reel and resetting of foam switch with ignition on.

3) Foam switch not being turned off in preparation for training."

These events have consequences either environmentally or operationally that we must overcome.

Fire Commanders are to engage with their teams to work out strategies and procedures to overcome this continually happening."

4.6.3. Lines of Evidence

1. Airservices GHD Preliminary Site Contamination Assessment Darwin ARFF Drill Ground, September 2008 (**Appendix 3**), Figure 3:

   Soil sediment sampling near drainage line (not in), Sample ID: BH5-02: PFOS 1.9 mg/kg and PFOA 0.66 mg/kg.

2. Airservices GHD Site Contamination Assessment 2012, dated 2.08.2012 (**Appendix 3**), samples taken (referenced from RAAF Base HHRA):

   Sediment sampling in the drainage lines, Sample ID 243-SED01: max PFOS concentration is 39000 µg/kg, max PFOA concentration is 42 µg/kg.

3. BECA Site Visit Report no. DN-APT-SSR-001 dated 25.09.2015 (**Appendix 9**):

   Sample date: 30.03.2015, Project #9168 Trade Waste Agreement Management

   Darwin ARFF Drill ground:

   "Training waste water when foam is in use is to be directed to sewer via the separator."

   A water sample was taken from the wash down bay pit:

   Table 9: BECA report no. DN-APT-SSR-001 (25.09.2015) - ARFFS station wash down bay water sample

Analyte	Results (µg/L)	DIA TWA (µg/L)
C6-C9 + C10-C36	<70	30 000
PFOS	1.44	0.3
PFOA	0.077	0.3
6:2Fts	<0.10	0.05
8:2FtS	0.25	0.05

   A sample was taken from the hot fire training ground separator after three days of rainfall:

   Table 10: BECA report no. DN-APT-SSR-001 (25.09.2015) - Hot Fire Training Ground separator water sample

Analyte	Results (µg/L)	DIA TWA (µg/L)
C6-C9 + C10-C36	<70	30 000
PFOS	256	0.3
PFOA	87.7	0.3
6:2Fts	18.1	0.05
8:2FtS	39.6	0.05

4. CIRRIS incident report no. OCC-0006303, dated 19.07.2016 (**Appendix 10, Table 16**):

"As part of the audit the station auditor checked the position of the foam switch, foam percentage switch and the hose reel switch at 0845 on the morning of 19.07.2016. All switches observed in the correct position at this stage. At approximately 11.00 the duty crew conducted aircraft familiarisation to visit military aircraft. At this time a trainee firefighter had a folder with the paperwork for the visit placed in front of the foam percentage switch. When retrieving the folder it is believed he accidentally bumped the foam percentage switch and placed it on 1%. During the afternoon the CASA auditor sampled said vehicle and found the foam percentage switch at 1%.

Switch was set to correct position immediately. Crew were advised of the repercussions of the switch being set to 1%. Further discussion took place between EVT's and fire staff and it was identified that it had been previously noted in the PIR that a lock switch should be placed on this switch and it was deemed necessary."

5. CIRRIS incident report no. OCC-0006342 dated 21.08.2016 Large Mock Up training pad (**Appendix 10, Table 16**):

   "During a training exercise, the foam switch was left in the on position and we produced foam through the foam-making branch. The spill was contained in the bunded training ground. Spoke with station commander [redacted]. He confirmed that the foam was contained on the pad. Approximately 50L of produced foam was released on the pad equivalent to (3L of Ansulite concentrate). As it is dry season the foam was left to evaporate. The drill ground is on RAAF land, no notification was made to RAAF since the release was on the pad. No notification was made to DIA. Station manager [redacted] also confirmed that the root cause was operator error, specifically the failure to set the foam switch to "off" during the training exercise. It appears that since there was no use of the spill kit as per ENV-GUIDE-0004p7, there will be a residue of Ansulite on the pad from this spill, which over time will go through the WWTP and be disposed to sewer. Waste water disposed of to sewer in wash bay area." No evidence was provided for transporting the waste to the wash bay area.

6. CIRRIS incident no. OCC-0007121 dated 4.09.2017, LMU training ground (**Appendix 10, Table 16**):

   "We were conducting a training exercise when foam was produced from one of the vehicles in the exercise. The nearside outlet through a foam making branch. Immediately shut the branch and shut down the pump. Under run the hose into the bunded LMU pad, returned to station and parked the vehicle in the wash down bay which has a separator and vehicle was flushed out. Waste water removed from LMU Cleanaway."

7. Darwin ARFFS Local Instruction dated 15.10.2017 amended Darwin ARFFS Local Instruction for foam contamination incidents during training (**Appendix 7**):

   "The truck is to be washed out at the training ground and the waste water stored in the retention dam for disposal by a licensed waste facility."

8. Waste certificate dated 22.11.2017 (**Appendix 6**):

   The waste certificate coincides with the CIRRIS incident no. OCC-0007121 mentioned above.

   The AEO was informed of the event from the DIA environmental manager. AEO requested that evidence be provided to demonstrate that the wash bay area is connected to sewer. DIA

notified NT Power and Water Corporation of the incident who advised that PFOS and PFOA was not on the trade waste certificate. Airservices was required to store all wastes from incidents in the retention dam and arrange for a certified waste disposal contractor to collect and dispose of the waste.

9. Department of Defence RAAF Base Darwin Detailed Site Investigation – Per and Poly-flouroalkyl Substances (PFAS), dated November 2017 (**Appendix 3**):

   Section 8.1.1 Soil

   Current Fire Training Ground (AEC 17)

   "PFOS exceeded HIL (recreational – 1,200 µg/kg) - the majority of impacts within the upper 0.5m of soils at the site, or within sediment samples from adjacent drainage areas (GHD 2012a)."

   8.1.2 Groundwater

   The maximum PFAS concentration in the dry season 2017 sampling event was detected in 1302_243_MW02 (48 µg/L PFOS, 90 µg/L of total PFAS). The reported concentrations were approximately double those reported at the end of the wet season in April 2017, and the PFOS (but not PFOA) concentration is an order of magnitude higher than reported in March 2012. The PFAS impact migrating from the area is delineated to the west and north, and does not extend beyond the site boundary.

   The mix of PFAS compounds in 1302_243_MW02 differs from elsewhere onsite (Figure 8 11), and PFOA and fluorotelomers are relatively abundant consistent with Ansulite having been used at the training ground. The presence of non-PFOS/PFHxS compounds decreases with distance from the source area (Figure 8 12), although PFHxA is still relatively high compared to elsewhere in groundwater at the base.

   Section 8.1.4 Infrastructure Sampling

   Sampling of sediments, concrete or waste waters from selected infrastructure identified elevated concentrations in waste waters from the current fire training area. Concentrations in sediment collected from pits and concrete samples were not highly contaminated, although leaching may result in contribution to local surface water or groundwater contamination.

10. Review of information regarding storage volumes and records of PFAS and PFOA.

    Environmental Assurance Report 2013 stated (**Appendix 3**):

    "AFFF Foam storage:

    AFFF is stored on site in an 8200L bulk storage tank within a permanent bund, as well as in 8x1000L covered totes located within the smoke hut bund area."

11. In an interview with the AEO, Airservices' Senior Operational Standards Specialist stated (**Airservices Interview no. 1, Appendix 5**):

    "*there was a statement, a directive from 2009 that states no totes should be disposed of."*

12. In an interview with the AEO, Airservices' Environmental Systems and Assurance Manager stated (**Airservices Interview no. 1, Appendix 5**):

"*One of the key findings of our first assurance sweep across the country was that totes were not being appropriately stored. From that there was a big drive initiated by* [redacted] *to get all the totes removed from site.*"

13. In an interview with the AEO, Airservices' Senior Operational Standards Specialist stated (**Airservices Interview no. 1, Appendix 5**):

    "We had a contract with a company called Geocycle Australia. Geocycle use the foam and mix it with other industrial waste to form fuel for cement kilns. The reason we were sent there by the DOE is that the cement films actually have a temperature and a dwell time that breaks the carbon bonds in the AFFF. They also took all our solid waste and that went into restricted landfill. That includes totes."

    AEO question: *"Do you have records of the tote removal documentation? "*

    Airservices' Senior Operational Standards Specialist response:

    "We did that for every location except for Darwin and Townsville. The records would not show a straight correlation with foam usage as some totes were old and the foam needed to be placed in newer totes etc. There was also a high volume of AFFF wastewater from washing of equipment and cleaning *of tanks etc. This waste was also placed into totes and this affected the number of totes disposed of."*

    AEO question: *"Is there a* process *to check that you have all of the empty totes at Darwin?"*

    Airservices' Senior Operational Standards Specialist response:

    "*There is no standing process."*

    AEO question: "*Can you calculate it from the foam use?"*

    Airservices' Senior Operational Standards Specialist response:

    "You can do that easily however, I think you will find you will probably have more empty totes. However, the complication *is – is that Darwin has a bulk tote foam storage. Which means somebody has emptied out the foam totes into a bulk foam storage tank. 2010 onwards you could calculate it however, what happened prior to that becomes murky."*

14. AEO calculation of the approximated foam concentrate stores on Darwin Airport. The calculation is based upon three pieces of information:

    - Airservices issued a task request on 4.02.2013 (**Appendix 2**) to Darwin and Townsville ARFFS stations to complete a stock take of all AFFF foam concentrate stored onsite. Consequently, a recorded stocktake of AFFF was undertaken at both stations (**Appendix 2**).
    - The electronic record of all foam concentrate used. *Note:* This record starts from 2010. The current Darwin Fire Commander provided an updated record of all reported uses of foam concentrate since 2010.

15. Email dated 8.05.2018 - response to AEO query regarding onsite foam concentrate storage and empty tote containers (**Appendix 2**). The Darwin Fire Commander responded with 8 full totes of foam concentrate (photographic evidence provided) and 9 empty totes.

16. There was a standing direction dated 23.09.2009 (**Appendix 2**) to all stations to not sell or recycle totes.

17. The findings of the comparison of empty totes vs incidents is as follows (**Appendix 2**):

    a. 2010 ARFFS commenced recording all use of foam concentrate.

    b. Foam use during training ceased in 2010.

    c. The 8.05.2018 email from Airservices Corporate states that the electronic report provided shows nil usage of foam concentrate for the topping up of tenders since 2011. The last operational use of Ansulite was the Brazilia incident 2010 (aircraft incident) and last recorded instance of maintenance top up of foam from the reserve foam stocks was during commissioning of T23 on 19/08/2011 when 1,400 L of concentrate was used.

    d. February 2013 - a total of 22 totes are recorded and calculated at the station. This comprised 8 full and 14 empty or part full totes (only the 8 full totes were approved for operational use), plus 8,000 L in the bulk storage tank for a total onsite volume onsite of 16,000 L.

    e. In **Airservices Interview no. 1**, Airservices' Senior Operational Standards Specialist explained that prior to 2010, all totes were stored onsite and that Airservices only commenced recording foam concentrate use in 2010. The Airservices' Senior Operational Standards Specialist reasoned that if there were discrepancies in foam concentrate volumes held onsite and the total number of empty totes, it is likely that the additional totes date back to pre-2010.

    f. In 2012-2013, approximately 3-4 totes of Ansulite foam were transferred to the Darwin Station.

    g. 12.04.2018 - 5 empty totes were disposed of through a waste disposal facility.

    h. 8.05.2018 email states 8 full totes and 9 empty totes were onsite.

18. Comparison of recorded foam use and record of empty totes onsite.

    In **Airservices Interview no. 1**, Airservices' Senior Operational Standards Specialist stated that:

    "totes could have been stored *from prior 2010."*

19. There were no records provided to the AEO to satisfactorily audit the transfer of full totes from other stations to the Darwin Station.

20. During the Airservices' interviews, it was confirmed by all current ARFFS and Corporate Airservices' staff that only water had been used when attending bush fires on Darwin Airport.

21. NT EPA soil testing results from sampling conducted on 27.02.2018:

    The NT EPA took samples at the HFTG site, including a sediment sample from the open unlined storm water drain and a water sample from the storm water drain which is the discharge point from the HFTG pad. However, the results provided do not include duplicate soil or water samples. The quality assurance and quality control of the sampling cannot be confirmed, as it is a requirement of the NEPM 2013 to take duplicate samples when undertaking sampling of soil or water. The results can be considered as anecdotal evidence only.

Table 11: NT EPA sampling results for Hot Fire Training Ground (27.02.2018) - open drain soil sampling and storm water sampling

	Units	Sample ID	NEMP (criteria) (open space)
		Sed 2	
PFOS + PFHXs	mg/kg	0.31	1.0
PFOA	mg/kg	<0.005	10.0
		SW2	**NEMP (criteria) (recreational)**
PFOS + PFHXs	µg/L	26	0.7
PFOA	µg/L	3.9	5.6

22. Darwin RAAF Base draft Human Health Risk Assessment July 2018 (**Appendix 3**):

5.3.1 Nature and extent of impact
AEC 17: Current Fire Training Ground Appendix A, Figure 8g

SOIL

"On average the highest PFOS/PFHXs levels displayed as >1000 µg/kg are along the storm water drainage line. NEMP criteria for soil for open space for PFOS/PFHXs is 1mg/kg or 1000 µg/kg. A soil sediment sample taken from the SW drain on 7.09.2017 was PFOS 1200 µg/kg exceeding the NEMP criteria for Soil – human health screening levels for public open space which is 1000 µg/kg. It did not exceed the NEMP criteria for PFOA."

4.6.4. Discussion

The complainant asserted that a number of emails sent to the Darwin ARFFS station staff by Senior Officers in Airservices, reminding them to ensure that the foam switch was selected 'off' prior to conducting training activities, indicated additional instances of foam discharge had occurred. He alleged that these discharges were not reported. The complainant has provided no further evidence to substantiate the allegation.

Interviews were conducted by the AEO with four current Airservices' staff members. These staff ranged from the Darwin Fire Commander to operational level staff. All staff were separately questioned about instances of accidental discharge and all consistently advised that they were not aware or had not witnessed any instances of accidental discharge that were not reported to Airservices via the CIRRIS reporting system.

Interviewees were asked by the AEO if they felt comfortable reporting incidences to Senior Station Management and all responded that they were. The employees also demonstrated other anonymous options that are available to staff to report incidents.

As part of the investigation, the AEO reviewed foam stock records and calculated the volume of foam concentrate held onsite in the bulk storage tank and in onsite totes. These records were then compared to the records of foam concentrate used, to ascertain if the total volume onsite met the expected volume following use (intentional and reported accidental use).

In the interview with the AEO, Airservices' Senior Operational Standards Specialist explained that prior to 2010, all totes, both empty and full, were stored on site. In 2010, Airservices started recording use of foam concentrate. In 2013, Airservices came to an agreement with Defence to use Ansulite foam only for a fire event. Water was to be used during training. As a result of this decision, both Darwin and Townsville ARFFS personnel were asked to undertake a stock take of all volumes of Ansulite foam held on their respective sites. Airservices' Senior Operational Standards Specialist reasoned that if there were discrepancies in foam volumes held onsite and the total number of empty totes at Darwin Airport, this may be due to historical storage of empty totes and may be related to foam use from before 2010, which is prior to Airservices commencing the recording of foam concentrate use.

Additional full totes were transferred to Darwin and Townsville from Airservices' facilities at other airports in 2013. Ansulite was retained at Darwin and Townsville Airports due to the requirement for this foam concentrate to be available for protection of military aircraft and facilities. The estimated number of full totes was provided to the AEO in an email from Airservices. The email dated 4.06.2013, subject: *Darwin ARFF investigation additional queries* states:

"As a point of clarification, no empty totes were redistributed from other ARFFS sites to Darwin. When AFFF concentrate was removed from other ARFFS sites in 2012-13, foam in totes held at Alice Springs and Ayers Rock was shipped to Darwin to be held as part of the reserve foam stockholding. From memory there were three or four totes of foam involved."

Total Ansulite concentrate at Darwin Airport has remained relatively static since 2014 with total stores of 15,900 L recorded during a weekly stocktake on 29 March 2016. This total consists of the last recorded volume of 8 full totes (8 x 1,000 L) and approximately 7,900 L in the bulk tank, excluding any held in fire tenders. The current Airservices' system only indicates use and does not appear to record volumes.

Airservices and Defence have conducted several monitoring events at their various facilities, some of which have identified potential contamination by use of Ansulite which likely occurred as a result of one or several discharge events at these sites.

A sampling result from Airservices' consultant BECA in 2015, indicates that Ansulite foam has been discharged either during training or as a result of accidental discharge. The BECA Report DN-APT-SSR-001 dated 25.09.2015 indicated impact to water by PFAS at the HFTG oil phase separator plate. There is no concurrent CIRRIS event or record of foam use for this date or period of time. There is no solid evidence that this discharge was to the environment. Note: samples were not taken at the storm water outlet or irrigation pipe discharge.

The Department of Defense 2012 GHD report and 2017 Detailed Site investigation (DSI) testing of sediment in the HFTG storm water drains and the drainage line indicate that there were exceedances of PFOS and PFOA in the surface soil in both locations. The findings of the 2017 DSI groundwater testing confirmed this result and indicated that there had been an increase in the groundwater contamination from 2012. The findings indicated that the contamination was specific to Ansulite foam.

The results from the NT EPA's limited monitoring conducted in February 2018 can only be considered as anecdotal information for this inquiry, as the sampling was not undertaken using the NEPM process which requires duplicates for confirmation of results. The results for both

sediment and ground water from GHD and Defence investigations indicate that an increase in Ansulite foam contamination in the soil sediment and groundwater has occurred in the time period 2012-2018. However, there is no evidence to indicate that the exceedances occurred from a discharge of Ansulite foam to the environment outside of the training pad. The DSI has indicated that leaching of Ansulite from the training ground infrastructure is occurring (**Appendix 3**).

Prior to the CIRRIS OCC-0007121 incident of discharge of foam in 2017, which resulted in NT Power and Water Corporation advising that discharge to sewer of PFAS contaminated waters was to cease, other incidents involving the discharge of foam were not reported to DIA or the AEO. It should be noted that provided the release of impacted waters was confined to discharge to sewer, it can be argued that Airservices was not required to report the incidents, as they did not result in impact to the environment. Any impact from discharge to sewer is an issue to be managed by NT Power and Water Corporation.

A review of totes and bulk foam concentrate storage held on the Darwin ARFFS site and records of foam concentrate storage and use since 2010 have demonstrated that the Darwin ARFFS station is not keeping accountable records of foam concentrate use. Records provided to the AEO, whilst indicate running totals, lacked descriptive details for a number of entries where there were changes in the foam stock totals and did not indicate who conducted the stocktake or provide signed evidence that stocktakes were completed. The volume held in the bulk store is particularly problematic, as it needs to be recorded and marked to ensure that minimal volumes are not being released to the bunded area. Additionally, the records do not indicate the volumes released from tenders as a result of accidental discharge until the tenders are refilled during maintenance. The last record of tender maintenance top up with Ansulite foam is recorded as occurring in April 2011. Minor amounts of foam being used were recorded in February 2012 (45 L) and August 2015 (50 L), but without any description of use. From April 2016 onwards Airservices did not provide any detailed records of foam use, as Airservices advised that no foam was released from the reserve foam stores during this period.

Without more detailed information, the exact volume of foam concentrate that may have been released due to accidental discharge could not be determined.

The complainant specified in his accusation that Airservices failed to report incidences of foam discharge to the environment. On a number of occasions above, it is indicated that there have been incidences of Ansulite foam impacts, but these may be attributed to reported incidents of accidental discharge and contributions of PFAS contamination through leaching from Airservices' infrastructure.

Without other supportive evidence, the complainant's allegation that Airservices failed to report instances of foam discharge to the environment cannot be substantiated other than to note that impacts may have occurred from Airservices' procedures that required discharge from pads in the wet season to be directed to storm water, and that this action may have resulted in impacts to the environment surrounding the training infrastructure from leaching of PFAS from concrete and other materials.

4.6.5. Regulatory Application

The discussion above highlights that there has been a number of incidences of accidental foam discharge and that limited monitoring conducted at the HFTG has identified raised concentrations of PFAS contaminates in groundwater that can be attributed to Ansulite foam.

Airservices' CIRRIS reports confirm that there have been a number of accidental discharges of foam during routine equipment checks. These incidents have not been reported to either the Department of Defence, DIA or the AEO. While it may be argued that discharges that do not enter the environment but are captured by pollution control equipment do not trigger the requirement to report an incident of pollution within 14 days under regulation 6.04 of the AEPR, monitoring has indicated that they may have contributed to PFAS concentrations identified in groundwater from the use of Ansulite foam.

Airservices has a statutory obligation under regulation 6.05 of the AEPR to establish and maintain appropriate systems to monitor the environmental consequences of its activities and to report the results of its monitoring to the airport lessee company. It is apparent that Airservices' environmental management system has failed to include appropriate systems and procedures to ensure that incidents that have the potential to result in pollution are reported to DIA and the AEO.

4.6.6. Outcome and Recommendations

The allegation is not substantiated.

Nevertheless, it is recommended Airservices implement systems and controls to enable the Darwin ARFFS station to accurately record foam stockpiles and use.

Procedures should be developed to ensure early identification of any discrepancy in vehicle and reserve foam stockpiles. This should include frequent audits by a Senior Station Officer of volumes held in vehicles and containers, with results recorded in a manner that can be audited by Airservices' consultants as part of periodic reviews.

Annual audits should also be conducted to record:

- volumes of foam concentrate held onsite, broken down by container type and including an accounting for each type of full tote;
- count of empty totes;
- maintenance records for topping up of tenders; and
- records of licensed waste disposal of empty totes.

Airservices are encouraged to conduct annual audits of this system. It is recommended that this audit be conducted by an external body, i.e. BECA or other independent consultant, and the results included in Airservices' annual environment report to DIA.

4.7. ALLEGATION 6: ENVIRONMENTAL CONTAMINATION FROM THE USE OF FIREFIGHTING FOAM DURING A BUSH FIRE INCIDENT ON DARWIN AIRPORT

4.7.1. Allegation

The complainant asserts Darwin ARFFS personnel used firefighting foam during a bush fire incident both on the civil and military side of the airport between 11-14 September 2015 and that ARFFS personnel hid this fact and any potential impacts this operation may have had on the environment.

4.7.2. Lines of Evidence

1. A chain of forwarded emails with the subject: *Notification of Occurrence OCC-0005655* sent to the Department on 23.02.2018 (**Appendix 4**) referenced a bush fire that occurred on 11.09.2015 and 14.09.2015. The complainant was of the opinion that Darwin ARFFS personnel had not disclosed the full facts of the incident.

   The incident appeared to be a fire of bushland and grassland between the Eastern Helipad and Amy Johnson Road.

   The first email was a query after the fire was lodged into the CIRRIS system. An Airservices' Corporate employee was requesting further information, including:

   - the location of the fire and where water was discharged;
   - the amount of water used;
   - the amount of water decanted into state fire trucks;
   - the date and time of the fire starting and ending;
   - the total quantity of water;
   - whether ARFFS had discharged any water offsite; and
   - any drainage lines or water bodies within 50m.

   The complainant responded by providing a map of the area affected by fire and where ARFFS water was discharged. The amount of water discharged was 25,000 L on-airport and 7,000 L off-airport. The amount of water decanted into NTFRS trucks was 37,000 L, bringing the overall total of water used to 69,000 L.

   The final email is an email from the Acting Fire Station Manager advising the complainant to be more accurate with the volume of water used. The complainant responds to this email by stating that the volume of 69,000 L has been reported in a number of reports and that the volume of 18,000 L recorded in the Operational Response System (ORS) report is incorrect.

2. **Airservices' Interviewees 1** and **5** (**Appendix 5**) stated that foam was not approved for use during bush fire operations and that only water was used during these operations. They also advised that the only time foam may have been considered for use during a bush fire, was if the fire was threatening the ammunition storage bunkers and was likely to present a danger to the public and/or base facilities. Senior management would then be required to decide if

foam use was warranted. ARFFS staff consistently reported to the AEO that foam was not used to manage the 2015 bush fire on Darwin Airport.

The above requirement limiting use of firefighting foam was confirmed by the Station Fire Commander in **Interview 5**.

3. A copy of the Darwin ARFFS reserve stock report dated 9.04.2018 was provided which indicated that no foam concentrate had been used for operations on Darwin Airport since an incident with a Brazilia Aircraft in 22.03.2010.

   Further examination of Airservices' records indicated that no foam concentrate was used between 2013 and 2018.

   Prior to the bush fire incident, the volume recorded in Airservices' reserve foam stockpile on 08.09.2015 was 15,900 L. This total was the same when a stocktake was conducted after the bush fire incident on 20.09.2015, thus indicating that no foam was used during the September 2015 bush fire.

4.7.3. Discussion

All Airservices' staff interviewed as part of this investigation were directly asked whether foam was used during the bush fire at Darwin Airport on 11 September and 14 September 2015. All interviewed staff who attended the incidents advised that only water was used to control this fire and that only water was approved for use for control of bush fires. The only caveat was in the event fire threatened the ammunition bunkers, but this was not the case for this incident.

A review of Airservices' reserve foam stockpiles indicated that no foam was used during this period.

No evidence has been provided by the complainant or found during the investigation to support this allegation.

4.7.4. Regulatory Application

This allegation was investigated against regulation 4.01 of the AEPR in relation to the general duty of an operator of an undertaking at federally-leased airports to take all reasonable and practicable measures to prevent the generation of pollution from the undertaking or, if prevention is not reasonable or practicable, to minimise the generation of pollution from the undertaking.

4.7.5. Outcome and Recommendations

Interviews with Airservices' ARFFS personnel and records of foam use indicate that no foam was used to put out the respective bush fire incident. The allegation is not substantiated.

4.8. ALLEGATION 7: DISCHARGE OF CONTAMINATED WATER DURING DAILY TESTING OF FIRE TENDERS RESULTED IN IMPACTS TO STORM WATER DRAINAGE

4.8.1. Allegation

The complainant alleges that accidental discharges of foam during daily testing of fire tenders on Rescue Road had resulted in 'tainted' waters impacting the storm water drainage system.

4.8.2. Lines of Evidence

1. CIRRIS incident OCC-0007479 dated 23.02.2018 - Foam Discharge on Rescue Road (**Appendix 10**):

   "Whilst conducting the daily inspection foam was produced during the pump test. The pump test was not conducted as stated in AFFM – MK8, which resulted in larger area of contamination."

   Action included collection via absorption material and cleanout and discharge of remaining water tank contents to LMU for subsequent collection in the retention dam. Effluent and solid waste were collected by licensed contractor (Waste Certificate No. 002051).

2. CIRRIS Incident OCC-0007491 dated 27.02.2018 (**Appendix 10**):

   "Daily vehicle pump test conducted on Tender 3. The foam hose and reel switch was confirmed off multiple times between [redacted] *the driver and operator* [redacted]*. I as the operator* [redacted] *discharged the hose reel that immediately produced a small amount of foam. Approximately held down for one second.*

   After notifying the FSM, FC and SO the procedures were followed to contain and clean up the foam. Tender 3 was taken to the pad and tested through all the outlets. No further foam was produced. EVT [redacted] *was convinced that the foam was residual foam from a previous discharge and T3 was put back online as operational."*

3. Site Inspection 24.03.2018 at the ARFFS station and training ground located on Rescue Road on the civilian side of the airport (**Appendix 1**):

   - Photo 22 - daily morning checks of the tenders were undertaken on Rescue Road. This location was where the accidental release of foam had occurred during the morning check;
   - Photo 23 - a small driveway was on the eastern side of Rescue Road;
   - Photo 24 - a small side road into substation 3 is on the eastern side of Rescue Road;
   - Photo 25, 26 - there is a storm water drain on both the western and eastern side of the road;
   - Photo 27 - Rescue Road ends with a storm water outlet drain that enters into the main storm water drain.

4.8.3. Discussion

The complainant has provided no supporting documentation for his allegations other than photographs of CIRRIS incident reports from Airservices' reporting system. These reports detail that discharges had occurred onto Rescue Road and that the contamination was captured using pollution control equipment prior to entering the storm water system. Wastes were stored and subsequently removed by licensed contractors.

Daily training required water to be discharged from all systems on tenders to confirm operational readiness. In 2015, Airservices amended their operational systems to require the foam activation switch to be left in the on position at all times other than during daily testing or training (training with foam ceased in 2013). Airservices has advised that incidents have occurred due to the foam activation switch being left on or being bumped. For all reported instances of foam discharge, the waste was either captured on Rescue Road prior to entering the drainage system or on the training pads where it was either left to evaporate or was subsequently discharged to sewer or collected by a licensed waste contractor.

Emails provided by the complainant as part of this and other allegations, indicate that management were aware of this issue and were providing timely reminders to staff to check the foam position to ensure that it was switched off prior to conducting daily operational checks of the water discharge systems.

Results of sampling of sediment or waters in the storm water system near Rescue Road are not available.

Without further evidence, the complainant's allegation that testing of tenders is impacting the stormwater system cannot be substantiated.

DIA commenced a program of routine monitoring of surface and ground waters (including PFAS) in 2016 and produces reports on a seasonal basis. Samples are taken after the dry season, the wet season and the first high rainfall of the wet season. Copies of the resulting monitoring reports are routinely provided to the AEO and a summary of the results from this monitoring program are included in the airport's Annual Environment Report to the Department.

It is a requirement of regulation 6.05(1) of the AEPR that sublessees, such as Airservices, have systems in place to support monitoring conducted by the airport lessee company (DIA). To ensure compliance with this regulation, it is reasonable to expect Airservices to expand its routine testing program to include sampling from the drains on Rescue Road and establish a groundwater monitoring network around its operational facilities, with the results provided to DIA to support the airport's routine monitoring program.

4.8.4. Regulatory Application

This allegation was investigated against regulation 4.01 of the AEPR in relation to the general duty of an operator of an undertaking at federally-leased airports to take all reasonable and practicable measures to prevent the generation of pollution from the undertaking or, if prevention is not reasonable or practicable, to minimise the generation of pollution from the undertaking.

In accordance with regulation 4.03 "*Duty – Pollution control equipment*" of the AEPR, it is recommended Airservices consider relocating future daily testing checks to an area designed to capture accidental foam discharges and connected to a storage tank. This will assist Airservices to comply with regulation 4.01 "*General duty to avoid polluting*" of the AEPR which requires operators to take all reasonable and practical measures to ensure that their operations do not cause pollution.

4.8.5. Outcome and Recommendations

There is insufficient information to substantiate this allegation.

To ensure compliance with AEPR regulation 6.05 "*Duties of sublessees and licensees*", it is recommended Airservices expand its current monitoring program to include monitoring of surface and ground waters on a routine basis to support the monitoring program currently being conducted by DIA. This should include establishment of a ground water monitoring network around Airservices' existing and decommissioned facilities, including sentinel and operational monitoring bores. It is recommended Airservices work with the AEO and DIA to develop a sampling plan in alignment with the PFAS NEMP.

In accordance with AEPR regulation 4.03 "*Duty – Pollution control equipment*", it is recommended Airservices consider relocating future daily testing checks to an area appropriately designed to capture foam discharges. The area should be of sufficient capacity to capture and retain discharges from the largest tender and be connected to a storage tank of sufficient capacity to hold any volume reasonably expected to accumulate.

4.9. ALLEGATION 8: SELLING OF TOTES TO THE PUBLIC

4.9.1. Allegation

The complainant alleges that up to 50 empty plastic totes, with a volume of approximately 1000L each and used for storage of AFFF and other liquids, were sold to the public for approximately $100 apiece and the money used to fund the operation of the Darwin ARFFS tea club. No firm evidence for this allegation was provided.

4.9.2. Lines of Evidence

1. Airservices email dated 23.09.2009 (**Appendix 2**) sent to all stations required them to cease disposal and recycling of totes and hold the totes on station until further notice.

2. Task request sent to Darwin and Townsville stations dated 4.02.2013 (**Appendix 2**):

   "Airservices has agreed with Defence that ARFF operations at Darwin and Townsville will not transition to Solberg RF6 foam in the near future. In both locations AFFF will continue to be used as the firefighting foam.

   To facilitate this change in planning it is necessary to confirm the quantity and condition of all holdings of AFFF at Darwin and Townsville."

3. Examination of Airservices' records during this investigation indicated a minimum of 14 empty totes were onsite in 2013. All Airservices' staff interviewed said totes had not been sold to

fund the station's tea club and that it was funded by staff contribution. Only the longest serving staff member recalled totes being disposed of and that it was likely to have been prior to 2009 when disposal ceased. He did recall that a small number may have been provided to past staff members or the public prior to this date and stated:

"about 15 years ago about 10 totes were sold at the time [redacted] *was the station manager"*

"the totes went to some employees and a member of the public that lived on a rural block."

Records were not available for disposal of totes to staff or members of the public.

4.9.3. Discussion

The complainant provided no evidence or documentation to support his allegation that totes were provided or sold to staff or members of the public, but interviews with Airservices' staff indicate that this may have occurred with a small number of totes approximately 15 years ago or prior to 2003. Due to the time passed since this practice may have occurred, the number of totes involved cannot be determined.

Current Airservices' documentation (ENV-001, s4.7.3, **Appendix 8**) notes that drums, totes or other containers that have contained AFFF are not to be reused for any purpose. They are to be stored in a bunded area until they are disposed of under national management arrangements. There is no evidence this instruction has been contravened since the Airservices' direction was issued in September 2009.

There is no substantive evidence to confirm this allegation, only anecdotal evidence. In any case, the provision of totes to the public does not fall within the meaning of 'pollution' in Part 2, Division 1 of the AEPR, thus regulation 4.01 does not apply to it.

4.9.4. Regulatory Application

The provision of totes to the public does not constitute 'pollution' as defined in the AEPR, thus regulation 4.01 does not apply to it.

4.9.5. Outcome and Recommendations

There is no substantive evidence to confirm this allegation, only anecdotal evidence that a small number of totes may have been sold approximately 15 years ago prior to 2003. Given the time passed, the number of totes involved cannot be determined. Airservices issued a direction in September 2009 that drums, totes or other containers previously containing AFFF were not to be reused for any purpose, but were to be stored in a bunded area until disposed of under national management arrangements. There is no evidence to suggest this instruction has been contravened.

5. CONCLUSION and RECOMMENDATIONS

In response to 42 emails sent by a former Airservices' employee (the complainant) to the Department of Infrastructure, Regional development and Cities (the Department) in February 2018, the Airport Environment Officer (AEO) at Darwin International Airport, supported by another AEO, conducted an environmental regulatory investigation into eight core allegations identified from the emails and an interview with the complainant. At the time of making the allegations, the complainant was still an Airservices' employee at the Darwin ARFFS fire station.

The detailed findings, regulatory review and recommendations of this investigation are contained in Chapter 4 of this report and a summary of the outcome and resulting recommendations are presented below.

The eight core allegations and their findings are:

1. **WASTE WATER FROM THE HOT FIRE TRAINING GROUND (HFTG) WAS USED FOR IRRIGATION (POST-2010)**

   Regulation 4.01 of the AEPR does not apply to the alleged conduct. The investigation confirmed the use of waste water for irrigation purposes in the area immediately adjoining the HFTG up to 2010 and that in 2010 an Airservices' Local Instruction was issued to direct staff to cease this practice. However, the investigation highlighted the lack of internal checks to determine if Airservices' staff were complying with the Local Instruction. While a number of waste disposal certificates indicated appropriate removal of waste water from the HFTG via a licensed waste facility post-2010, there were intermittent gaps in the records. Therefore, there is insufficient evidence to confirm that the practice of using waste water for irrigation purposes was fully discontinued after 2010.

2. **WASTE WATER FROM THE ARFFS 'MOCK UP' HFTG WAS RELEASED INTO THE STORM WATER SYSTEM**

   Regulation 4.01 of the AEPR does not apply to the alleged conduct. Nevertheless, the investigation confirmed the *ad hoc* release of waste water from the HFTG to storm water. However, in December 2017 the valve handles for release to storm water at the HFTG on the military side and the fire station training ground on the civil side of the airport were removed, thus preventing any further release of waste water to storm water at both training grounds.

3. **WASTE WATER FROM THE WASH DOWN BAY AREA WAS RELEASED TO SEWER**

   This allegation was substantiated up to September 2017, however it does not contravene regulation 4.01 of the AEPR. The practice of discharging to sewer ceased in September 2017 with all waste being subsequently diverted to a waste disposal contractor.

4. **WASTE WATER FROM THE STATION RETENTION DAM WAS RELEASED TO STORM WATER (POST-SEPTEMBER 2017)**

   The allegation is not substantiated.

5. **ACCIDENTAL DISCHARGES OF FOAM INTO THE ENVIRONMENT WERE NOT REPORTED THROUGH AIRSERVICES' STANDARD REPORTING PROCEDURES**

   The allegation is not substantiated. However, it is recommended Airservices ensure an accurate accounting of minor foam discharges is in place in accordance with regulation 6.05(1) of the AEPR.

6. **ENVIRONMENTAL CONTAMINATION FROM THE USE OF FIREFIGHTING FOAM DURING A BUSH FIRE INCIDENT ON DARWIN AIRPORT**

   The allegation is not substantiated.

7. **DISCHARGE OF CONTAMINATED WATER DURING DAILY TESTING OF FIRE TENDERS RESULTED IN IMPACTS TO STORM WATER DRAINAGE**

   There is insufficient information to substantiate this allegation. In accordance with regulation 6.05(1) of the AEPR, it is recommended Airservices expand its current monitoring program to include monitoring of surface and ground waters on a routine basis around its facilities to support the monitoring program currently being conducted by DIA. Furthermore, in accordance with regulation 4.03 of the AEPR, it is recommended Airservices consider relocating future daily testing of fire tenders to an area designed to capture accidental foam discharges.

8. **SELLING OF TOTES TO THE PUBLIC**

   The provision of totes to the public does not fall within the meaning of 'pollution' in Part 2, Division 1 of the AEPR, thus regulation 4.01 of the AEPR does not apply to it. Nevertheless, the AEO has investigated this matter and determined there is no substantive evidence to confirm this allegation, only anecdotal evidence. Interviews with Airservices' staff indicate that a small number of totes may have been sold approximately 15 years ago prior to 2003. Given the time passed, the number of totes involved cannot be determined. Airservices issued a direction in September 2009 that drums, totes or other containers previously containing AFFF were not to be reused for any purpose, but were to be stored in a bunded area until disposed of under national management arrangements. There is no evidence to suggest this instruction has been contravened.

The investigators were provided with access to current Airservices' staff and documentation which detail environmental management at the Darwin ARFFS station from 2010 to the present. The investigation found that for the period 2010 to late 2017, Darwin ARFFS failed to comply with a number of national directives from Airservices and its own Local Instructions, and that this resulted in non-conformances that may have had potential adverse impacts on the environment.

Nationally, Airservices undertakes Environmental Assurance Assessments (EAA) every two to three years. This program is designed to provide feedback to ARFFS management and personnel regarding environmental performance and to identify emerging issues with the potential for future environmental management implications in accordance with regulation 6.05(1) of the AEPR. The findings from each assessment are compared to those of previous assessments to identify non-compliances and areas for improvements. Where non-compliances are identified, actions for improvement are outlined.

A recurring issue was identified in assurance assessments which relates to the quality of waste water being discharged to sewer or storm water. A review by the investigators of EAAs from 2010 to 2017 suggests Airservices did not monitor storm water quality or act on the recommendations in the EAAs with regards to assessing the risk of releasing waste water to storm water.

Additionally, Airservices did not respond to issues identified in the audit and assurance reports that indicated Darwin ARFFS personnel were not operating in accordance with national directives and Local Instructions. Such repeated indications of non-compliance should have triggered direct intervention by Airservices to audit compliance with Local Instructions and initiate actions to ensure compliance.

It is noted Airservices did not adequately monitor the waste disposal systems utilised at Darwin Airport through appropriate logging of waste tracking receipts or similar methods. In addition, a review of Airservices' records suggests that between 2010 and September 2017, Airservices did not adequately communicate with DIA or the AEO when incidents or failures of equipment had the potential to cause adverse impacts to the environment. This review also found the system currently being used to record foam volumes appears to not be fully auditable.

During the course of this investigation, Airservices reviewed and revised its Environmental Management System (EMS) and subordinate environmental documents. These changes should address many of the issues identified in this report. However, insufficient time has elapsed to demonstrate changes in practice have occurred. It is also noted that national guidance for the management of PFAS only became available in February 2018 with the release of the PFAS National Environmental Management Plan (NEMP).

Airservices has acknowledged PFAS containing foams have been used for control of aviation fires at Darwin Airport since 1995. Airservices used 3M Lightwater from 1995 to 2003, then transitioned to Ansulite which was thought to be PFAS-free at the time, but later found to contain trace amounts of PFAS. In 2010, Airservices transitioned to a PFAS-free foam (Solberg Rehealing RF6 foam) for operational responses at all civilian airports where Airservices provides ARFFS. Moreover, since 2010, Airservices ARFFS personnel have not used foam during routine training (only water is used).

At Darwin Airport, Airservices provides ARFFS under contract to Defence which, until recently, has required the use of Ansulite for incidents only. However, since 2010 Airservices has not had to use Ansulite foam for incidents at Darwin Airport. Airservices is currently in the process of transitioning to PFAS-free Solberg RF6 foam at Darwin Airport, with the transition expected to be completed in mid-2019.

Intermittent testing conducted by consultants engaged by Airservices in 2015, 2017 and 2018 at the Darwin Airport fire station facilities suggests residual traces of PFAS continue to leach from the training pad on the civil side of the airport. In addition, sampling undertaken in July 2014 during decommissioning of an underground tank at the Darwin station identified PFAS impacts to soil and groundwater.

Given the historical use of PFAS containing foams and the limited nature of sampling undertaken to date at Airservices' facilities on the civil side of the airport, it would be useful to conduct a risk assessment of the station training ground with regards to PFAS leaching. This information would

be beneficial in developing a site-specific PFAS management plan and appropriate remediation measures.

RECOMMENDATIONS

Under Part 6, Division 1 of the AEPR, there is a requirement for effective pollution monitoring and reporting, as well as establishing and maintaining appropriate environmental management systems. This will help determine any presence or potential migration of contaminants from operational sites on the civilian side of the airport. On this basis, it is recommended Airservices:

1. expand its current monitoring program to include surface and ground waters on a routine basis to support the monitoring program being conducted by DIA. It is recommended Airservices work with the AEO and DIA to develop a sampling plan in alignment with the PFAS NEMP.

2. undertake a risk assessment of the station training ground with regards to PFAS leaching.

3. establish an equipment testing area specifically designed to capture accidental discharges of foam during daily or other routine equipment testing on the civilian side of the airport. The area should be appropriately designed with sufficient capacity to capture and retain discharges from the largest fire tender. It is also recommended the area be connected to a storage tank of sufficient capacity to hold any volume that can reasonably be expected to accumulate.

4. arrange for an independent ISO 14001 external review of its environmental management system at Darwin Airport.

5. review the implementation of its environmental management system to support compliance with these recommendations, national standards, guidelines and regulations, and Airservices' Local Instructions.

6. conduct annual audits to confirm on-ground actions by Darwin ARFFS personnel are compliant with Airservices' Local Instructions and national procedures, with a timely follow-up for any identified non-compliances.

7. ensure reporting of non-compliances or environmental incidents to DIA and the AEO where these actions have the potential to cause harm to the environment.

8. implement systems and controls to enable the accurate recording of foam usage and stockpiles. Procedures should be developed to ensure early identification of any discrepancy in vehicle and reserve foam stockpiles. This should include regular audits by a senior station officer and a record of full volumes for each container type. Annual audits should also be conducted to record and verify:
   - volumes of foam concentrate held onsite, broken down by container type;
   - count of empty and full totes;
   - maintenance records for topping up of tenders; and
   - records for disposal of empty totes by licensed waste contractors.

   Identified discrepancies should be reported to DIA, the AEO and, where relevant, to Defence, as soon as practicable.

9. continue ongoing collaboration with Defence to regularly review the environmental risks for the release of waste water from the hot fire training ground on the military side of the airport

to ensure compliance with national standards and adequate protection of receiving environments.

Recommendations 1 to 6 above are consistent with the need to take all reasonable and practicable measures to prevent or minimise the generation of pollution as required under regulation 4.01 of the AEPR. Recommendations 1, 7 and 8 are consistent with the requirement under regulation 6.05 of the AEPR to ensure effective monitoring and reporting of environmental consequences of activities on the airport site.

Recommendations 1 and 2 regarding PFAS monitoring and conducting a risk assessment are consistent with the PFAS NEMP and the National Environment Protection (Assessment of Site Contamination) Measure 1999 (amended 2013). Recommendations 5 to 8 focus on procedural improvements to Airservices' current environmental management system and operational processes, as well as identify further areas for improvement; all of which are based upon the intent of the AEPR regulatory framework. The AEPR advocates continuous environmental improvement, including constantly improving environmental management practices for airport activities.

While the AEPR does not apply to the military side of the airport, Recommendation 9 is consistent with environmental best practice to take all reasonable and practicable measures to prevent or minimise the generation of pollution.