

PFAS Remediation of
Former Fire Training Ground (FFTG)
at Launceston Airport, Tasmania

SUBMISSION 1.0
(PUBLIC)

STATEMENT OF EVIDENCE TO THE
PARLIAMENTARY STANDING COMMITTEE ON
PUBLIC WORKS

12 OCTOBER 2023

Airservices Australia, PFAS Remediation of Former Fire Training Ground (FFTG) at Launceston Airport, Tasmania
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EXECUTIVE SUMMARY

1. The proposed project prioritises remedial actions as part of Airservices Australia's approach to the management of Per- and Poly-Fluoroalkyl Substances (PFAS) contamination resulting from the historical firefighting operations on the site of the Former Firefighting Training Ground (FFTG) at Launceston Airport, Tasmania. Airservices proactively identified the site for remediation as the contamination source is in a non-operational area of the site lease enabling removal/remediation works to occur without affecting airport operational service delivery.
2. Remediation will be conducted in accordance with a Remediation Action Plan (RAP) prepared by an independent consultancy firm (AECOM), reviewed by an Independent Assessor (a qualified contaminated land auditor), in consultation with Australia Pacific Airports (Launceston) and endorsed by the Commonwealth Airport Environmental Officer (AEO) within the Department of Infrastructure, Transport, Regional Development, Communications and the Arts. Remediation will be conducted within requirements of state and federal legislation.
3. The project scope of works prioritises removal and/or management of PFAS impacted:
 - Infrastructure (FFTG canopy and drainage, FFTG concrete pad, the french drain and sump and smoke hut)
 - Wastewater related infrastructure (tanks, coalescing plate separator underground storage tank) and evaporation pond; and
 - Soil and/or sediment.
4. Remediation prioritises soil remediation based on the site conditions and investigation results to date. The process will target the remediation of an estimated 90% of the PFAS mass (400 kg) in the soils. This is expected to significantly mitigate risks to potential receptors on-site and to reduce so far as reasonably practical the migration of PFAS on the Site. See soil management table breakdown, Table 2.
5. Works are expected to be completed approximately 5-8 months after commencement, subject to favourable weather conditions. The expected life and whole-of-life costs of the proposed works is \$24,010,054 which is inclusive of post-remedial testing and validation, as well as a contingency of \$4,884,054.
6. Environmental investigations have been completed and concluded the Project will not have a significant impact on existing environmental values. A Site Heritage Management Plan has been completed, and determined the Project has the potential to impact Aboriginal heritage

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values. The Site Heritage Management Plan provides a series of policies and management measures to guide the mitigation of any impacts involved with the proposed works.

7. Airservices operates under an Environmental Management System that aligns to the International Standard ISO 14001, and the Project will be executed under appropriate environmental and heritage management plans.
8. Project design has included completion of self-assessments specific to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Significant Impact Guidelines 1.1 and 1.2 in addition to consultation with Aboriginal Heritage Tasmania. The overall project delivery methodology includes a detailed Site Heritage Management Plan and Unanticipated Discovery Plan.

Project Title

Airservices Australia, PFAS Remediation of Former Fire Training Ground (FFTG) at Launceston Airport, Tasmania.

Airservices Australia

1. Airservices Australia (Airservices) is a government-owned organisation established under the *Air Services Act 1995* for the provision of air traffic management, air navigation support (communications infrastructure, radar and navigation aids) and Aviation Rescue Fire Fighting (ARFF) services to the aviation industry.
2. Airservices derives its revenue from the provision of air traffic control and ARFF services, which funds its operating expenses and investment in capital works.
3. Airservices operates commercially on a fee-for-service basis and generally receives no Government appropriations. Government funding was received over the course of the COVID-19 pandemic to offset the significant reduction in revenue resulting from the impact of the pandemic on the aviation industry and ensure Airservices could continue to provide essential services.

Context

4. PFAS is a group of manufactured chemicals that have historically been used in commercial products and for industrial applications such as firefighting foam. Historically, firefighting foams containing PFAS were used by firefighting organisations around Australia, including Airservices. PFAS chemicals formed part of the chemical composition of Aqueous Fire Fighting Foams (AFFF) which were effective in fighting liquid fuel fires due to their excellent thermal stability and hydrophobic properties.
5. The unique chemical compound characteristics of PFAS make them non-biodegradable and highly soluble in water, which means they can readily leach into soil, surface water and groundwater leading to bioaccumulation. Given the chemical properties and the prevalent use of PFAS historically in Australia, the National Chemicals Working Group of the Heads of the Australian and New Zealand Environmental Protection Agency has classified PFAS as a high priority for environmental regulators around Australia and current advice is that exposure to PFAS should be limited.

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6. The PFAS National Environmental Management Plan (PFAS NEMP v2) provides guidelines and recommendations for risk-based prioritisation of sites likely to have been contaminated, specifically evaluating both the likelihood and consequence of harm occurring from historical use and/or potential mass of PFAS used on the Site.

Purpose of works

7. The proposed project prioritises removal and/or management of PFAS-impacted:
 - Infrastructure – FFTG canopy and drainage, FFTG concrete pad, the French Drain and sump and smoke hut
 - Wastewater and related infrastructure – tanks, coalescing plate separator underground storage tank and Evaporation Pond
 - Soil and sediment.
8. These works aim to remediate 90% of the estimated PFAS mass residing in soil and sediment on the Site. This removal will require the excavation of approximately 18,000 m³ of soils (see Table 2 below). Modelling estimates that approximately 397.6 kg of PFAS mass resides in the remediation area to a depth 5.0 metres below ground level (m BGL). Approximately 87.6% of this mass resides in the top 1.6 metres. The remediation of 90% of contaminated soils on the Site is expected to have consequential improvement to groundwater and surface water conditions reducing the overall risk of ongoing contamination migration on the site.

Need for works

9. The presence and extent of PFAS at Launceston Airport is currently the subject of a Detailed Site Investigation (DSI) and Human Health and Ecological Risk Assessment (HHERA) commissioned by Airservices in accordance with guidance provided by the National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) (NEPM).
10. Sampling conducted during the DSI (and prior studies commissioned by Airservices and others) has identified PFAS in soil, sediment and groundwater with concentrations above relevant guidelines as contained in the PFAS NEMP v2.
11. Based on these results, and consistent with guidance provided in the PFAS NEPM v2 relating to developing risk-based remediation strategies, Airservices has proactively identified the FFTG site for remediation as the contamination source is in a non-operational area of the site lease enabling remediation works to occur without affecting airport operational service delivery.
12. The overarching objective of the remediation works is to reduce the overall PFAS footprint on site by removing a known source and thereby reduce overall exposure pathways.
13. The remedial actions of this project will also address the Environmental Remediation Order (ERO) issued 30 March 2023 by the Department of Infrastructure, Transport, Regional Development, Communications and the Arts (DITRDCA) (the airport environmental regulator) under the Airports (Environment Protection) Regulations 1997, noting that the Remediation Action Plan that will guide the works has been endorsed by the Airport Environmental Officer.

Options considered

14. A detailed options assessment has been prepared in accordance with national guidance documents including the PFAS NEPM V2, and National Remediation Framework. This options assessment is presented within the Remediation Action Plan and factors in the availability of remediation technologies, the value for money in achieving the remediation objectives and the sustainability of options.
15. A 'do nothing' option was considered however this option would be inconsistent with guidance to take precautionary risk-based management actions nor would it achieve the requirements of the ERO.
16. Soil remediation was the chosen preferred option to achieve the remediation objectives. As a subset of soil remediation, the works will utilise a range of remediation options consistent with adopted national remediation hierarchy.
17. Active remediation of groundwater was not considered to be a viable option due to the currently available remediation technologies and the context of the Site. Instead, soil remediation is expected to result in a consequential improvement in groundwater.

Scope of works

Site

18. The FFTG area is in the north-eastern part of the airport along the boundary (as depicted in Figure 1 and Figure 2 in Appendix 2). The site is situated on a terrace front with an elevation of approximately 170 metres Australian Height Datum. The lease area covers approximately 5,968 m², previously used for ARFF training exercises including the use of water and aqueous film forming foam (AFFF) for firefighting purposes.
19. The layout of the FFTG has been modified several times over the last 60 years and was decommissioned in 2014. The site comprises the FFTG including various buildings and the FFTG Pipe with discharge point to the southwest.
20. The project design is informed and guided by the PFAS NEMP v2 and will be implemented according to relevant state and federal legislation while complying with the conditions of the

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site lease. The project design has been shared with key stakeholders including the lease holder of the airport. For details on the parties consulted see paragraph 45.

Table 1 – FFTG Launceston Airport, Tasmania - Site Identification Information (RAP, AECOM 30 June 2023)

Item	Description
Site Owner	Commonwealth of Australia
Site Occupier	Australia Pacific Airports (Launceston) Pty. Ltd
Site Lessee	Airservices Australia
Title Identification Details	Portion of Lot 2 on registered plan 844116
Site Area	Approximately 8500 m ²
Site Elevation	Approximately 170 metres Australian Height Datum (m AHD)
Site Zoning	Proposed: Aviation Support and Freight – Airside under the Launceston Master Plan 2020.
Current Land Use	Vacant portion of the Operational Domestic Airport
Former Land Use	Former fire training ground
Proposed Land Use	Aviation Support and Freight Precinct (operational support facilities and possibly solar farm and/or flight training academy)
Relevant Sensitive Matters	<ul style="list-style-type: none"> • Potential Green and Gold Frog (Master Plan, 2020) and Growling Grass Frog Habitat (FFTG Evaporation Pond). Whilst the Master Plan does not consider this an environmentally significant area, regards for the ecological value is still to be considered. • Potential Area of Sensitivity (Aboriginal Heritage) - Master Plan 2020

Planning and design concepts

21. Iterative investigations at the site since 2008, as listed below in Appendix 4, have assessed, and monitored soil, sediment and groundwater impacts. Supporting investigations including ecological risk assessments, human health risk assessments, remediation feasibility trials, and a series of groundwater and soil monitoring events have culminated in the production of the RAP. The RAP addresses soil, sediment, surface water, and groundwater infrastructure impacts at and from the FFTG. The proposed project prioritises removal and/or management of PFAS-impacted:

- Infrastructure – FFTG canopy and drainage, FFTG concrete pad, the French drain and sump and smoke hut
- Wastewater and related infrastructure – tanks, coalescing plate separator underground storage tank and evaporation pond
- Soil and sediment.

22. Site maps showing infrastructure, wastewater related infrastructure and the area for remediation can be found in Appendix 2 Figure 2. The objective of these works is to remediate 90% of the estimated PFAS mass residing in soil/sediment on the site, estimated excavation requirement of works is approximately 18000 m³ of soils, see Table 2. Modelling estimates that approximately 397.6 kg of PFAS mass resides in the remediation area to a depth 5.0 metres below ground level. Approximately 87.6% of this mass resides in the top 1.6 metres. Removal of the bulk of PFAS mass residing on site is expected to have consequential improvement to groundwater and surface water conditions, reducing the overall risk of ongoing contamination migration on and from the Site.

23. The site remediation includes a combination of excavation, stabilisation, validation, reinstatement or transportation for hazardous waste treatment and disposal interstate. Site excavation soils will be stabilised on-site using ex situ methodologies which separate out debris from the soil/sediment; the soils are then mixed with selected stabilising agents, such as activated carbon, before being retested or validated for contamination levels. Where stabilised soils values are tested and successfully validated against permissible reuse values as specified in the PFAS NEMP v2, the soils will be reinstated on-site as part of the rehabilitation process. Conversely, where stabilised soils values exceed re-use threshold values at the validation stage, soils will be transported off-site using certified hazardous waste methods for interstate thermal destruction. Thermal treatment uses heat to remove the contaminants under strict emission control protocols.

Table 2: FFTG Site Soil Excavation Forecast: Management Breakdown (RAP, AECOM 30 June 2023)

PFOS + PFHxS Concentration (mg/kg)	Indicative Depth (mBGL)	Management Method	Potential Volume (m ³)	Tonnage (tonnes)
≤ 20	0.0-5.0	Ex-situ Stabilisation and Reinstatement	16,170	41,070
20-50	0.0-1.8	Off-Airport Disposal to Local Landfill	470	1,150
> 50	0.0-0.6	Off-Airport Thermal Destruction (Interstate)	1,450	3,570
Total			18,090	45,790

*Perfluorooctane Sulfonate (PFOS), Perfluorohexane Sulfonate (PFHxS)

** metres Below Ground Level (mBGL)

24. The objectives of these processes are to:

- Reduce risk from PFAS impacts to personnel, and users on-airport.
 - a. Reduce risk of exposure to PFAS for onsite personnel by excavation, treatment and reinstatement or removal of impacted infrastructure and impacted soils that exceed the Health Investigation Levels (HILs) for commercial industrial land use of 20 mg/kg of PFOS + PFHxS .
- Reduce risk to environment on and off-airport inclusive of flora and fauna;
 - a. Reduce risk of exposure to PFAS for ecological receptors by excavation, treatment and reinstatement PFOS + PFHxS impacted soils that exceed concentrations equal to or greater than 1 mg/kg to the extent practicable (noting that indirect ecological exposure is unlikely to occur on an operational airfield at depths greater than 1.6 / 2.0 mBGL).
- Manage and mitigate future PFAS migration via surface and/or groundwater;
 - a. Removal and management of a combined 90% of the residual PFAS mass in soil has been remediated to achieve potential mass flux reduction targets.
 - b. Reduce the off-airport mass flux of PFAS migrating from the Site, via removal/stabilisation of the Site's soil source area thus preventing transfer to groundwater and surface water by one order of magnitude or 95% reduction in pre-remediation PFAS mass flux.

Project scope

25. The project scope includes:

- Installation of temporary boundary fencing to enable safe site access without impacting airport or neighbour access or safety
- Demolition and removal of FFTG concrete pad, FFTG low-level roof, drainage infrastructure, treatment, and disposal off-site
- Removal (excavation) and stockpiling of soil within the lease site boundary
- Testing and validation of the treated material
- Implementation of on-site wastewater treatment including sediment containment, removal and disposal

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- Implementation of on-site soil and/or sediment treatment where feasible using ex-situ stabilisation following the sampling and analysis plan specified in the Validation Sampling Plan which will be prepared prior to commencement of remediation works.
- Transportation of soil and/or sediment with PFOS + PFHxS concentration > 50 mg/kg from site interstate for thermal treatment and disposal
- Backfilling excavation site/s with stabilised, validated product, and/or imported clean fill (as required) to achieve final landform elevations specified in RAP
- Installation of a low permeable compacted clay capping layer (or similar, for example bituminous layer) to reduce potential future infiltration
- Final surface contouring to direct run-off away from the remediation area to existing airport related drainage systems to prevent water infiltration and/or surface water run-off
- Pre- and post-remediation surface water mass flux studies
- Baseline groundwater mass flux assessments conducted as soon as practical following completion of soil remediation activities
- Rehabilitation and revegetation of the areas of the Site affected by the works.

26. No permanent infrastructure will be constructed as part of the works, however, the following transportable facilities, plant and equipment will be installed, operated and maintained to complete the works:

- Temporary site fencing around the perimeter of the remediation works area including boundary fence relocation;
- Temporary haul roads, stockpile areas and associated hardstand areas;
- Temporary site facilities for the remediation contractors workforce including site offices and associated worker amenities;
- Sheet piling for the creation of cells to allow the safe extraction and validation of the contaminated soil;
- Temporary site services and equipment including fuel oil, electricity, water, excavators and other similar earthwork equipment.

27. All decommissioned infrastructure will be segregated (and recycled) to the extent practical and disposed of off-Airport as construction and demolition waste according to Environmental Protection Agency guidelines. In addition to defining site remediation actions, this major works project will also address remedial actions outlined in the ERO of 30 March 2023, issued by DITRDCA.

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28. Airservices has appointed JBS & G as the Independent Assessor of the project RAP, and ongoing remediation works.

Security & Fire protection measures

29. Access to the site will be controlled by the primary contractor. The site boundary fence will be temporarily moved prior to commencement to enable works to be conducted landside minimising any risk and interruption posed to airside services and personnel. The temporary fence will be constructed around the former FFTG site. Site access will be restricted to authorised personnel and will only be permitted following a mandatory site induction process.

30. The works will be undertaken with due consideration and consultation with the Launceston Airport and associated services.

Workplace health and safety measures

31. Airservices and its contractors are committed to workplace health and safety. In accordance with Section 35(4) of the *Building and Construction Industry Improvement Act 2005* (Commonwealth), the remediation works contractor(s) will be required to hold full occupational health and safety accreditation from the Officer of the Federal Safety Commissioner under the Australian Government Building and Construction Work Health and Safety Accreditation Scheme.

32. The proposed works will be undertaken in accordance with relevant Tasmanian *Occupational Health and Safety Legislation (Work Health and Safety Act 2012)* and the approved project specific WHS Management Plan.

33. The site will be secured to prevent public access during construction. No special or unusual public safety risks have been identified.

Plans and drawings

34. Please refer to Appendix 2 for site and remediation area maps and Appendix 3 for remediation methodologies.

Other issues

Key legislation

35. All works will be conducted on Commonwealth land and predominately within Airservices existing lease of the FFTG. The proposed remediation does not require acquisition of additional land nor change to existing land use conditions.

36. The legislative framework for the planning and approval of works at the site includes:

- a. Commonwealth Legislation including:
 - i. *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) 1999 and Regulations 2000
 - ii. *Airports Act 1996* and subsidiary:
 - a. Airport (Environment Protection) Regulations 1997
 - iii. *Workplace Health and Safety Act 2011* as amended 2016
 - iv. *Environmental Management and Pollution Control (Waste Management) Regulations 2020*
 - v. National Environment Protection (Movement of Controlled Wastes between States and Territories) Measure
- b. State Legislation, as it relates to off-airport disposal of PFAS impacted soil and importation of clean-fill particularly the *Environment Protection Act 1970.52*.

37. The works will be undertaken in accordance with relevant Australian Standards and codes of practice including but not limited to:

- a. National Environmental Protection (Assessment of Site Contamination) Measure (1999) (NEPM);
- b. Australian Standard AS 4482.1, Guide to the Sampling and Investigation of Potentially Contaminated Soil Part 1: Non-volatile and Semi-volatile Compounds;
- c. Australian Standard AS4482.2 Guide to the sampling and investigation of potentially contaminated soil. Part 2: Volatile substances, and
- d. Tasmania Environmental Protection Agency Waste Management Procedure (TAS EPA, 2021)

Heritage and geographical considerations

38. The Launceston Airport Master Plan 2020 identified the site as having areas of potential

heritage sensitivity. Airservices, in consultation with Aboriginal Heritage Tasmania, commissioned AECOM to prepare a Site Heritage Management Plan (SHMP) which has been added to the overall project delivery methodology.

39. This plan specifies management actions required to be undertaken during execution of the Project to preserve heritage sensitive areas/items or sites, including a program of pre-works test pitting and an Unanticipated Discovery Plan to be followed during the works.

Environmental impact assessments

40. A Self-Assessment under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) has been completed against the Significant Impact Guidelines 1.1 and 1.2. The Self-Assessment does not indicate significant impacts on any matter protected under the Act are likely to occur as a result of the works. Airservices has determined that the Project is not required to be referred to the Minister for the Environment and Water under the EPBC Act.

41. Airservices operates under an Environmental Management System that aligns to the International Standard ISO 14001. The Project will be executed under appropriate environmental and heritage management plans commensurate with the scope of the Project.

Impact on local community

42. The impact of the proposed remediation works on the local community is likely to be minimal given the location of the FFTG on the airport. Traffic flow to and from the site is unlikely to be affected and it is not anticipated that significant heavy vehicle movements will be required with the exception of machinery and equipment arriving at site during site establishment and leaving site following completion of the works.
43. During the rehabilitation stage of the project clean soil material will be imported to the site. Traffic impact will be mitigated through a Traffic Management Plan established prior to the works commencing.

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Stakeholder consultation

44. Airservices continues a program of engagement with key stakeholders including:

- Australia Pacific Airports Launceston
- Airport Environment Officer, Department of Infrastructure, Transport, Regional Development, Communications, and the Arts
- Tasmanian Agencies including:
 - a. Environmental Protection Authority
 - b. Department of Natural Resources and Environment Tasmania
 - c. Department of Health
 - d. Aboriginal Heritage Tasmania

Further information on stakeholder consultation is provided in the Confidential submission.

Cost Effectiveness and Public Value

Project cost and budget

45. The expected life and whole-of-life costs of the proposed works is \$24,010,054 which includes a contingency of \$4,884,054.

46. This cost estimate includes delivery of the RAP, remediation works costs including excavation, treatment and disposal of soil/sediment, export to off-site thermal destruction facility (as required), stabilisation and reinstatement ex situ onsite (as appropriate), pad construction, tank removal, drain cleaning (as and where required) landscaping and make-good. The estimate includes the costs of Airservices' internal labour, application/authority fees and charges, laboratory validating costs (pre, during and post works), management fees and technical expertise costs including contingencies.

47. The cost estimate was prepared by a quantity surveyor and is at a P80 level of confidence. The detailed cost breakdown is provided in the confidential cost estimate (Submission 1.1).

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Project delivery method

48. All Airservices projects are managed in accordance with Airservices' Project Program and Portfolio Management Framework, which is based on four project life-cycle stages – Start up, Define, Execute and Close. An independent 'gate' review is conducted at the end of each stage to ensure readiness to proceed to the next phase.
49. Airservices will appoint an internal Project Manager and Contract Manager to manage and oversee the Principal Contractor who will be engaged by Airservices following parliamentary approval for the works to proceed.

Project schedule

50. Subject to Parliamentary approval, Airservices expects to approach the market and engage a contractor as soon as possible, with works expected to occur between March 2024 and August 2024.

Public value

51. The proposed works will address the impact of the historical use of PFAS containing firefighting foams at the FFTG.
52. The remedial process is anticipated to mitigate the migration of the contamination and will have a non-financial indirect impact on the common good.

Appendix 1 – Remediation Action Plan (RAP) Summary – Authored by AECOM under request of Airservices Australia.

AECOM Australia Pty Ltd (AECOM) was commissioned by Airservices Australia (Airservices) to prepare a Remedial Action Plan (RAP) for per- and poly-fluoroalkyl substances (PFAS) impacts identified at and near the former fire training ground (FFTG) at the Launceston Airport (the Airport). This RAP has been developed to implement planned soil remediation at the FFTG and to meet the requirements of the Environmental Remediation Order (ERO) relating to PFAS pollution at the FFTG. Off-Airport remediation is not considered in this RAP.

The Site (also referred to as the remediation area) comprises the FFTG and impacts nearby and the FFTG Pipe and discharge point to the southwest. Remedial activities will include removal, treatment and/or management of PFAS impacted soil and infrastructure.

The content presented in this RAP focusses on soil remediation with consequential improvement expected to groundwater and surface water conditions as a result of reducing the residual PFAS mass from the FFTG source area. At present, the Site setting and conditions along with available data supports a position of no active groundwater remediation. This position is further supported by the findings of the preliminary remedial options assessment, presented in this RAP. Consequently, this RAP outlines a staged approach to groundwater remedial assessment and action and determining if future action is warranted.

PFAS impact has occurred at the FFTG as a result of the historical use (direct release), storage and handling of aqueous film forming foam (AFFF) during firefighting training events.

The objectives of the RAP are to describe practical solutions so far as reasonably practicable (SFARP), to manage the PFAS impacted soil and infrastructure at the FFTG and select an appropriate preferred soil remedial methodology that will reduce the leachable PFAS mass at and near the FFTG and minimise PFAS flux from the remediation area.

Suitable remedial options were assessed for their ability to achieve the following soil remediation objectives:

- Reduce risk of exposure to PFAS for on-site personnel and ecological receptors by excavation, treatment and reinstatement or removal of impacted infrastructure and impacted soils above a defined threshold concentration.

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- Removal and management of a combined 90% of the residual PFAS mass in soil to achieve mass flux reduction targets
- Reduce to SFARP the mass flux of PFAS from the Site, via removal/stabilisation of the Site's soil source area thus preventing transfer to groundwater and surface water by one order of magnitude or 95% reduction of pre-remediation mass flux.

It is anticipated that by achieving soil remediation objectives, that a long-term reduction in PFAS concentrations and PFAS mass flux migrating to surface water and groundwater both on-site and off-Airport will consequently be achieved as a result of reducing the residual PFAS mass from the FFTG source area that can be mobilised.

Preliminary and detailed remedial options assessment's were variably completed for soil and groundwater.

The findings indicated that it is currently premature to consider active groundwater remediation. As a consequence, this RAP considers a staged approach to groundwater remediation, which will comprise groundwater monitoring activities pre- and post-soil remediation. The results of this monitoring would be complimented with testing of aquifer properties to determine the need for and requirements of any future direct groundwater remediation.

For soil remediation a combination of excavation, stabilisation, reinstatement and/or off-Airport disposal and/or off-Airport thermal destruction was selected as the preferred option for the remediation area. Following excavation, soil treatment/disposal, and reinstatement with the stabilised product, imported clean fill will be required to achieve final landform elevations. A low permeable compacted clay capping layer (or similar e.g. bituminous layer) would be installed over the entire treatment footprint to reduce potential future infiltration. The final surface will be contoured such that run off will be directed away from the remediation area to existing Airport related drainage systems to prevent water infiltration and/or surface water run-off.

Remediation performance and validation will be measured via

- Estimation (based on laboratory measurement) of excavated/managed PFAS mass
- Rainfall simulation to demonstrate the remediated area meets the remedial criteria
- Groundwater and surface water mass flux study post remedial works (comparison of pre- and post-remediation mass flux estimates leaving the Site)

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Long-term performance will be measured via reduction of PFAS concentrations in surface water and groundwater samples in the remedial area and immediately down gradient.

Prior to undertaking the remedial works, the following documentation will be prepared:

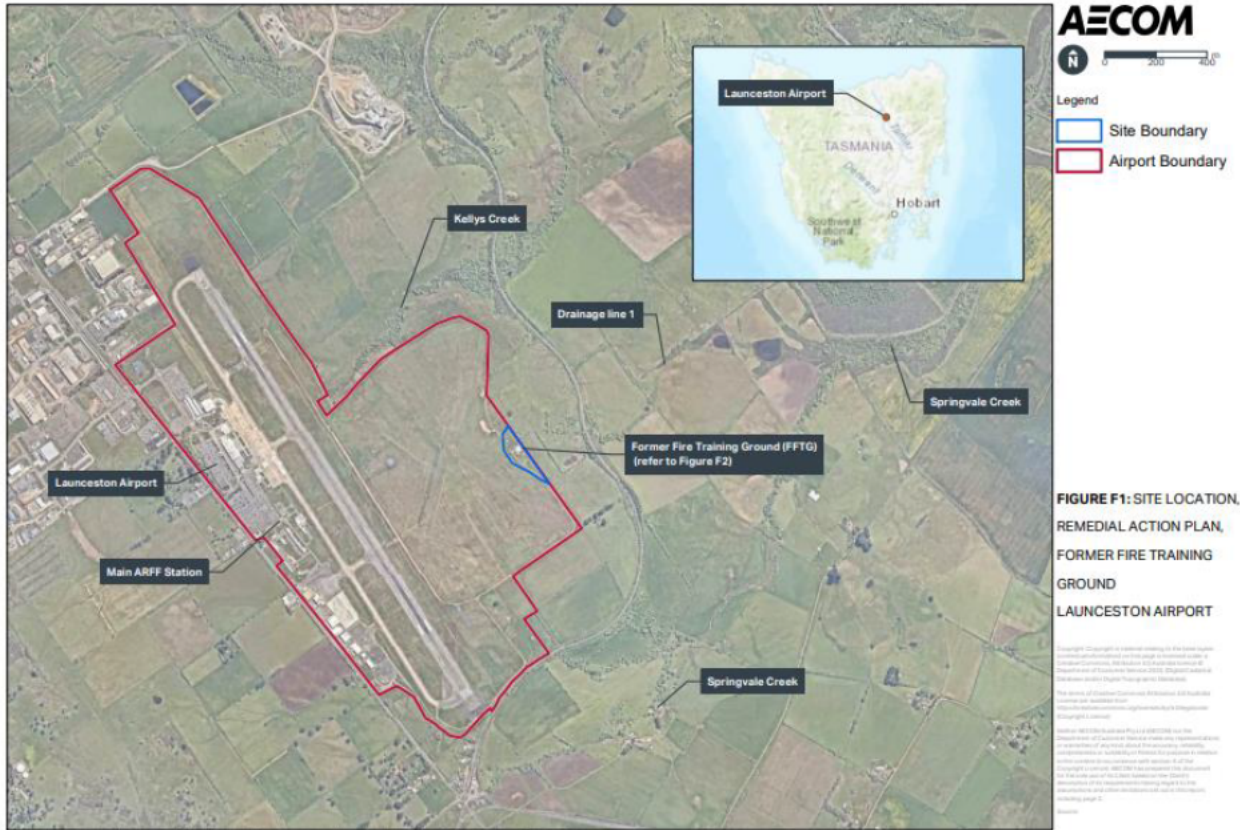
- Validation Sampling Plan (VSP) outlining the sampling, analysis, and quality requirements for the validation and remedial option sampling to be undertaken during the remedial works
- Remedial technical specification outlining the proposed technical approach to the remediation, including staging, excavation plan, soil treatment methodology and treatment criteria, work, health and safety requirements, and environmental management procedures.

Based on the review and assessment of the available data at the time of preparing this RAP, establishment remedial objectives, assessment of feasible remedial options, and provision of the remediation and validation methodologies presented, successful remediation of the PFAS impacted soil at the Site with commensurate improvements in PFAS impacts in groundwater under the Site is considered achievable by implementing this RAP. Data gaps have been identified and remain. Relevant gaps will be assessed prior to commencing the remedial / excavation works.

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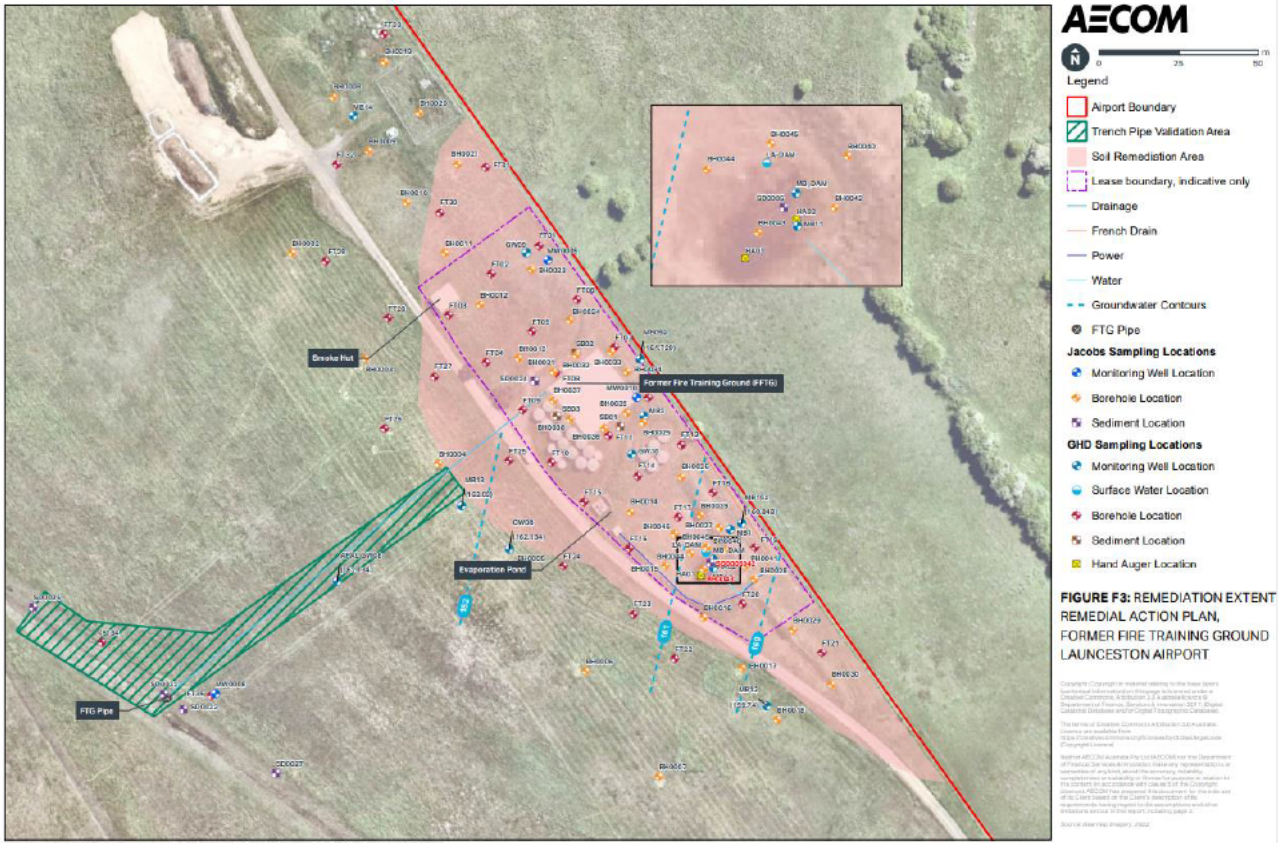
Appendix 2 - Airservices Australia, PFAS Remediation of Former Fire Training Ground (FFTG) at Launceston Airport, Tasmania Site Maps.

Figure 1: FFTG - Site Location Map (RAP, AECOM 30 June 2023)



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Figure 2: FFTG - Remediation Area Map (RAP, AECOM 30 June 2023)



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Appendix 3: Remediation Methodology Performance Criteria and Metrics (RAP, AECOM 30 June 2023)

Remedial Objective	Short Term (>1 year)		Medium Term (1 – 5 year)		Long Term (5+ years)	
	Goal	Measurement	Goal	Measurement	Goal	Measurement
Reduce exposure risk	Removal/treatment of soils with PFOS + PFHxS concentrations > 1mg/kg within 1.6 m of the surface and with PFOS + PFHxS concentrations >20 mg/kg below 1.6 m depth	Screening of results from excavation validation sampling against remediation criteria				
Removal of residual soil PFAS mass	Removal and management (including off-airport disposal and treatment and reinstatement) of 90% of the soil PFAS mass	Pre-remediation modelling compared against post-remediation modelling of soil PFAS mass based on incremental ex-situ stockpile sampling and excavation validation samples				
Surface water mass flux reduction	95% reduction in PFAS concentrations in surface water runoff from remediated areas (simulated rainfall test results)	Pre- and post-remediation simulated rainfall tests (washdown tests) conducted on remediated area	One order of magnitude difference in PFAS mass flux pre- and post-remediation and / or 95% reduction in estimated annualised PFAS mass flux from the FFTG in surface water	Autosampler locations as indicated in Figure F5 in Appendix A (noting that the reduction in flux response time is likely to be longer with increasing distance from the FFTG)		

Remedial Objective	Short Term (>1 year)		Medium Term (1 – 5 year)		Long Term (5+ years)	
	Goal	Measurement	Goal	Measurement	Goal	Measurement
Groundwater mass flux reduction	Reduction in transfer mechanism of PFAS from vadose zone soils to groundwater	Triaxial tests to estimate vertical infiltration rates through reinstated material, fill and capping layer	One order of magnitude difference in PFAS mass flux pre- and post-remediation and / or 90% reduction in groundwater PFAS concentrations under and flux leaving the FFTG	Pre-and post-remediation PFAS concentrations measured in groundwater via wells reinstated within the remediation area – and flux estimated in wells installed at airport boundary.	90% reduction in groundwater PFAS flux off-airport	Pre- and post-remediation PFAS groundwater flux estimates based on groundwater well transect installed approx. 100 m down hydraulic gradient

Appendix 4: Historic Site Investigations & Monitoring List

- GHD (2008) Report for ARFF National Testing Program. Preliminary Site Contamination Assessment, Launceston ARFF Drill Ground, Launceston Airport. GHD Pty Ltd (GHD). September 2008
- Sloane Geoscience - SGEO (2010) Launceston ARFFS Drill Ground - Groundwater and Surface Water Monitoring: August 2010
- SGEO (2013) Launceston ARFFS Drill Ground - Groundwater and Surface Water Monitoring: August 2013
- SGEO (2014a) Launceston ARFFS Drill Ground - Groundwater and Surface Water Monitoring: April 2014
- SGEO (2014b) Launceston ARFFS Drill Ground - Groundwater and Surface Water Monitoring: August 2014
- ELA (2010) Growling Grass Frog Assessment. Ecological Australia (ELA), May 2010
- ELA (2011) Growling Grass Frog Assessment. Ecological Australia (ELA), May 2011
- Sloane Geoscience Pty Ltd (SGEO) (2014) Airport, Western Junction. Groundwater and Surface water monitoring event April 2014
- SEMF (2013) Stockpile Sampling for Northern Flexible Pavement Repair- Launceston Airport, Western Junction 29 July 2013
- Asset Environmental (2016) Letter Report for Cirrus Australia 2 March 2016
- AECOM (2016) Presentation of Findings SAQP Implementation Speculative Off-Site Sampling Program, ARFF FFTG, Launceston Airport, Launceston, TAS 9 June 2016
- AECOM (2019). Preliminary Site Investigation and Limited Sampling, Launceston Airport, version V0.9, 07 May 2019
- GHD (2021) GHD Factual Report - Assessment of surface water run-off from the evaporation pond roof at the former firefighting training ground at Launceston Airport 15 September 2021
- GHD (2021) Growling Grass Frog Assessment, February 2021
- GHD (2022a). Launceston Airport, Former Fire Training Ground (FFTG) French Drain Assessment, 2 March 2022
- GHD (2022b). Launceston Airport, Environmental Brief Report, 19 May 2022
- Jacobs (2022c) PFAS csv file and figures extracted from draft
- GHD (2023) DSI report, 24 May 2023
- AECOM (2023) RAP, 30 June 2023 inclusive of Jacobs and GHD data