Senate Inquiry into the Contamination of Australia's Defence Force facilities and other Commonwealth, state and territory sites in Australia

Defence Submission Part A

18 December 2015

Executive Summary

The Department of Defence has identified that ground and surface water in and around RAAF Base Williamtown contains perfluorinated compounds, including perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). These compounds were contained in historical formulations of Aqueous Film Forming Foam (AFFF) used by Defence from the 1970s to the 2000s. The use of AFFF was widespread in Australia and worldwide in fire fighting foams which were used at any location where liquid fuel fires could occur. These chemicals were also found in a wide variety of industrial and consumer goods, such as water proofing on clothes, carpet and paint, cardboard and food packaging and in the manufacture of some non-stick cookware and other coated cooking appliances.

PFOS and PFOA are considered to be 'emerging contaminants.' There are no endorsed Australian guidelines for concentrations of PFOS and PFOA in water, food products, landfill or waste.

To date there are no peer reviewed studies in Australia or overseas confirming a link between these chemicals and human health impacts.

Defence takes its environmental stewardship obligations very seriously. Defence is required to meet the obligations of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in the conduct of activity which has potential environmental impacts. The EPBC Act covers matters of national environmental significance and actions affecting Commonwealth land.

As a matter of operational practice Defence undertakes environmental testing and investigations consistent with State environmental obligations to monitor environmental impacts and develop appropriate mitigation measures, if required. Environmental investigations in 2011 at RAAF Base Williamtown identified soil and groundwater contamination. Further studies have confirmed PFOS/PFOA contamination, both on site and off site, in groundwater and surface water. The current investigations involve further sampling to fill data gaps, stakeholder consultation, a community information session, human health and ecological risk assessment, remedial options assessment and the development of a remediation action plan.

In mid 2012, Defence corresponded with the New South Wales Environment Protection Authority (NSW EPA) and Hunter Water Corporation to inform them of the groundwater contamination and intended management strategies. Defence has kept the following key stakeholders informed of developments:

a. NSW Department of Premier and Cabinet;

b. Hunter Water Corporation;

c. NSW EPA;

d. Port Stephens Council;

e. NSW Department of Primary Industries (Office of Water);

f. NSW Health (Hunter New England District);

g. NSW Office of Environment & Heritage; and

h. Newcastle Airport Limited.

Defence is committed to keeping the community informed of the environmental investigation. Defence continues to participate in the NSW Government's Williamtown Contamination Investigation Community Reference Group. Community information sessions, direct mail and information sheets will continue as new information is available. Defence has also established and advertised a website, email and a community hotline.

This submission contains an overview of the issues surrounding contamination at RAAF Base Williamtown and other Defence sites with specific comments against each Term of Reference.

Background

1. Aqueous film forming foams (AFFF) containing high levels of PFOS and PFOA were used nationally and internationally by Defence and other organisation from the 1970s to the early 2000s.

2. PFOS and PFOA have also been used in a range of industrial, commercial and domestic products including:

a. Water proofing on clothes, carpet and paint;

b. Aviation hydraulic fluids;

c. Electronic components;

d. Wall treatments;

e. Cardboard and food packaging; and

f. In the manufacture of some non-stick cookware and other coated cooking appliances.

3. In 2003 the National Industrial Chemical Notification and Assessment Scheme (NICNAS) released an alert recommending that AFFF in its then form (3M Light Water) be restricted to essential use only and should not be used for training purposes. Defence has conformed with this recommendation and began phasing out the 3M Light Water product from 2004 and by 2011 had fully transitioned to a new form of AFFF (Ansulite.) Ansulite contains only trace elements of PFOS and PFOA.

4. Whilst PFOS and PFOA have been classified by international bodies as potentially presenting a risk to human health and the environment, these chemicals are still considered to be 'emerging contaminants'. Australia is a member of the Stockholm Convention on Persistent Organic Pollutants (POPs). The convention is a global treaty that aims to protect human health and the environment from the effects of POPs. PFOS was added to the list of convention annexes in 2009, although Australia is yet to ratify this addition.

5. There are no globally accepted peer reviewed studies showing that exposure to PFOS and PFOA affects human health. Long term, large scale health studies of workers in the USA exposed to high levels of these chemicals do not show chronic health effects. The National Health and Medical Research Council does not specify a level for these chemicals in the updated March 2015 Australian Drinking Water Quality Guidelines. In 2014 the International Agency for Research on Cancer published an assessment of the status of PFOA as a human carcinogen (Monogram 110, available in The Lancet, volume 15, August 2014). It assigned PFOA to class 2B. Class 2B substances are considered to be "possibly carcinogenic to humans". The IARC places substances into five categories: Class 1 (known carcinogen), Class 2A (probable carcinogen), Class 2B (possible carcinogen), Class 3 (not classifiable) and Class 4 (probably not a carcinogen).

Detections of PFOS/PFOA at Williamtown

6. In December 2011 Defence added PFOS and PFOA to its environmental monitoring program, particularly at bases where AFFF may have been used.

7. In 2011 PFOS and PFOA were detected at RAAF Base Williamtown. Further testing in 2012 identified PFOS in water exiting the base. In May 2012 Defence advised the NSW EPA of elevated levels of PFOS/PFOA in surface water leaving the base.

8. Defence undertook a Stage 1 investigation which was completed in March 2013. A copy of this report was sent to NSW EPA on 17 May 2013. The Stage 1 report identified potential contamination risks on the base and provided recommendations for further sampling and analysis. These recommendations informed the Stage 2 Investigations.

9. Defence engaged a contractor in 2013 to undertake the Stage 2 Environmental Investigation. This contractor went into business liquidation and was unable to continue.

10. Defence undertook a new procurement in accordance with the Commonwealth Procurement Rules and engaged a new contractor in April 2014. Sampling for Stage 2, commenced in May 2014.

11. This sampling identified high concentrations of contamination onsite at the old fire training pit and fire training pad, trade waste facilities, Lake Cochran, Sewage Treatment Plant and a former landfill site. There were also detections in surface water drainage channels off site, sediments along these channels and in some samples of small fish and grasses.

12. In September 2014 Defence wrote to stakeholders including Newcastle Airport Limited, NSW EPA, HWC, Port Stephens Council, NSW Department of Primary Industries (Office of Water), NSW Health (Hunter New England District) and NSW Office of Environment and Heritage to advise that the Stage 2 Environmental Investigation had commenced.

13. In October 2014 Defence launched a public website to advise the community of the Stage 2 Environmental Investigation and provide a flyer with drilling activities, an overview of the project, as well as supply a list of frequently asked questions with relevant answers. At this time, Defence also wrote to the NSW EPA and other stakeholders noted in paragraph 10, to advise of the commencement of the drilling and sampling program. The location map of proposed wells and the frequently asked questions were provided as attachments to the letter.

14. In November 2014, sampling and drilling commenced off site and progressed through to delivery of the draft Stage 2 report in August 2015.

Investigation and Testing Methodology

15. Defence is undertaking its investigations in accordance with the National Environmental Protection (Assessment of Site Contamination) Measure (NEPM).

16. The *National Environment Protection Council Act*, *1994* (Cth), allows for the making of National Environment Protection Measures under Part 3, Division 2. One of those National Environment Protection Measures is the National Environment Protection (Assessment of Site Contamination) Measure 1999 (the ASC NEPM). Australian States and Territories are responsible for implementation of the NEPM through relevant statutory controls in each jurisdiction. Defence is committed to acting in a manner consistent with relevant jurisdictional environmental legislation and regulations.

17. The ASC NEPM provides a means to support the protection of human health and the environment by establishing a nationally consistent approach to the assessment of site contamination. The ASC NEPM is intended to be used by all parties associated with site contamination including regulators, site assessors, environmental auditors, land owners, developers and industry.

18. The ASC NEPM describes a recommended process for the assessment of site contamination that includes:

- Preliminary site investigation;
- Detailed site investigation; and
- Site specific risk assessment.

19. These stages of an investigation are generally undertaken in a sequential manner with scoping of investigations being iterative, taking account of evidence gathered throughout each stage.

20. Defence is currently undertaking two testing activities at Williamtown. The first is an environmental investigation in line with the ASC NEPM framework. Defence is taking approximately 900 samples of ground water, surface water, soil, sediment and biota in and around RAAF Base Williamtown. This activity is known as the Stage 2B Environmental Investigation and includes the development of a human health risk assessment, an ecological risk assessment, an assessment of remediation options and development of a remediation plan. This process is intended to be completed by August 2016, with interim reporting in June 2016.

21. The second testing program is bore water testing. This program is informed by Water Use Surveys completed by residents. Defence applies a standard assessment methodology to determine who requires an alternative source of drinking water. That assessment considers each property's infrastructure, ground water contamination, and water use. As a result not all residents in the investigation area require bottled water.

22. As at 4 December 2015, in the bore water sampling program, Defence has visited 174 properties and taken 190 water samples from private bores and sampled 142 water tanks where bore water may have been stored for drinking purposes. Defence continues to prioritise the testing of bores for residents who indicate they drink bore water and have no access to alternative water supplies. Defence is supplying bottled water to 30 properties.

23. Of the 123 results provided so far, 101 bores have had no detections of the contaminants. Where positive detections above the US EPA Provisional Health Advisory (PHA) drinking water guidelines are made, letters are personally delivered to affected households.

24. The results of the bore water testing are also being used to inform the Stage 2B environmental investigations.

25. The NSW Government has established a Williamtown Expert Panel to explore the nature and extent of contamination from fire-fighting foams used historically at RAAF Base Williamtown and to recommend next steps. Defence's direct access to the NSW Government Williamtown Expert Panel has been limited as Defence is not a member.

26. The NSW Williamtown Expert Panel has advised Defence that additional sampling beyond the NEPM guidelines are required as part of the Stage 2B Environmental Investigation sampling plan.

27. Defence is cooperating with the NSW EPA and the NSW Government Williamtown Expert Panel with the intent to ensure the Stage 2B Assessment is a rigorous, orderly and evidence-based assessment of legacy PFOS/PFOA contamination at RAAF Base Williamtown and surrounds. In order to give the NSW EPA and the broader community additional confidence in this process, the Stage 2B Assessment is subject to a non-statutory site audit by Mr Anthony Lane of Cardno, a NSW accredited auditor.

28. Defence is conducting the human health risk assessment in accordance with the ASC NEPM and with other guidelines approved under the *Contaminated Land Management Act 1997 (NSW)* including Environmental Health Standing Committee (enHealth) guidelines. Defence agrees with the NSW Government Williamtown Expert Panel that a site-specific human health risk assessment, in accordance with Schedule B4 of the NEPM, is required as part of the Stage 2B investigation. Defence agrees that the overarching principles and general approach for conduct of the human health risk assessment that is outlined in the NSW Government Williamtown Expert Panel's Scoping Document is consistent with those guidelines.

29. Based on current information, it is too early to determine whether the sampling methodology outlined in the NSW Government Williamtown Expert Panel's Scoping Document will be necessary. In accordance with the process outlined in the ASC NEPM, an assessment of the source-pathway-receptor linkages will be undertaken before the sampling program is finalised, so that it appropriately reflects the exposure potential associated with each pathway. The need to undertake the sampling recommended by the NSW Government Williamtown Expert Panel is being evaluated as the potential exposure pathways are determined.

30. Defence's expert toxicologist, Mr Roger Drew (Toxconsult), is considering and advising Defence on the appropriate toxicity reference values to be adopted for the human health risk assessment. Mr Drew and Mr Lane are liaising with the NSW EPA to reach early agreement about the toxicity reference values to be adopted for the human health risk assessment.

31. Defence is prioritising specific elements of the sampling program to facilitate evaluation of potential risks associated with consumption of seafood. The data collected during this prioritised sampling will also inform the broader human health risk assessment.

32. Defence agrees with the NSW Government Williamtown Expert Panel that consistency in approach and messaging is a critical aspect of engagement with the local community on this issue.

Engagement with NSW EPA and Other Agencies

33. A timeline of engagement with the NSW EPA and other agencies is at Attachment A.

Community Engagement

34. Defence is committed to keeping the community informed of the environmental investigation. On 16 September 2015 Defence held a community consultation forum in conjunction with NSW Government officials and Hunter Water Corporation.

35. Defence is an active participant in the NSW Government's Williamtown Contamination Investigation Community Reference Group, which meets weekly. The first meeting of this reference group was on 01 October 2015 and Defence representatives have attended all the formal meetings of this group and the community information sessions organised by the group.

36. Community information sessions, direct mail and information sheets have and will continue to be sent out as new information becomes available. Defence has also established and advertised a website, email and a community hotline. The community hotline was established on 11 August 2015 and the web site has been operating since October 2014.

37. Air Vice Marshal Greg Evans is based at RAAF Base Williamtown and is the senior Defence spokesperson for this matter in the Williamtown area.

Financial Assistance

38. On 4 November 2015, the Commonwealth Government announced a financial assistance package for commercial fishers affected by the NSW Government's fishing bans in Tilligerry Creek and Fullerton Cove. Commercial fishers who derive the majority of their income from areas affected by the bans may be eligible for an Income Recovery Subsidy equivalent to Newstart or Youth Allowance, and Business Assistance Payments of up to $25,000. Commercial fishers who have experienced financial hardship as a direct result of the closure of fisheries may be eligible to receive an Income Recovery Subsidy backdated from the date of the original closure on 4 September 2015.

39. The assistance package, which is administered by the Commonwealth Department of Human Services, relates to those affected by the NSW Government official fishing closures and is available until 30 June 2016.

Compensation

40. The question of compensation is a matter separate to financial assistance and will depend upon a determination as to liability and quantification of losses attributable to actions by the Commonwealth. Defence has stated that it is too early to make any decisions as to compensation, as both the extent and effects of the contamination are not currently understood, and will not be understood for some time as environmental investigations continue. Legal issues relevant to compensation are informed by evidence and interpretation of evidence – both as to the sources of contamination, actions that give rise to an alleged loss, the actual loss claimed and possible contributory causal issues. There are a range of investigations and considerations that are in train – covering scientific, environmental, engineering and health matters. Defence is closely involved in these and will take them into account when considering claims for compensation.

CRC CARE

41. The Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) is an independent organisation that performs research, develops technologies and provides policy guidance for assessing, cleaning up and preventing contamination of soil, water and air. The majority of CRC CARE projects consist of academic research and development of limited trials of new technology to assess or remediate contaminated sites.

42. Defence entered into a relationship with CRC CARE in 2005. The initial agreement was from 2005 to 2011 with a subsequent agreement from 2011 to 2020.

43. CRC CARE has undertaken Defence-funded AFFF related projects including:

a. Environmental Fate of New Fire Suppressing Products (Ansulite AFFF and 3M RF) compared to Light Water project (2006). As a result of this study, Defence selected Ansulite as the approved AFFF for use on the Defence estate to replace the legacy AFFF used from the 1970s;

b. Toxicological analysis of Solberg and Ansulite Fire Fighting Products project (2012). In 2013, Defence affirmed with Air Services Australia that Ansulite would be used on the joint user airfields at Townsville and Darwin; and

c. Testing of Ansulite AFFF concentrate in 2014, in toxicological evaluation of fire fighting products.

44. Other CRC CARE projects with Defence include an AFFF Monitoring tool (2011) and trials of an AFFF waste water remediation plant. Two plants were installed - at RAAF Bases Edinburgh and Pearce. CRC CARE has reported that it has treated over 900,000 litres of AFFF wastewater to a concentration of less than 5 micrograms per litre at RAAF bases. The CRC CARE water remediation techniques are based on waste water remediation rather than large scale ground water remediation.

45. The plants at RAAF Bases Edinburgh and Pearce are not currently operational.

Screening criteria

46. In the absence of national guidelines, in May 2015 Defence adopted the CRC CARE-facilitated Technical Working Group draft PFOS/PFOA interim screening level criteria from its "*Assessment, management and remediation guidance for perfluorooctanesulfonate (PFOS) and perfluorooctanesulfonic acid (PFOA)Preliminary Report for TWG Workshop, March 2015*".

47. Defence determined that it was appropriate to adopt the Technical Working Group criteria as they had been developed by a group of industry experts, and State and Commonwealth Government representatives.

48. In May 2015 Defence released *Defence Contamination Directive #8 Interim Screening Criteria – Consistency of Toxicology or Ecotoxicology based Environmental Screening Levels for PFOS, PFOA and 6:2 FTS* (6:2 Fluorotelomer sulfonate) based on the Technical Working Group's recommended criteria.

Remediation

49. There have been repeated calls that Defence should block stormwater egress off the base and should also stop groundwater traversing across the base. There is no feasible way to stop water leaving the base because measures to prevent this would effectively create a dam. This could create flooding and potentially affect civil and military operations on the airfield. However, there may be opportunities to prevent localised contamination spreading by the use of either physical barriers or chemical binding additives.

50. All of these potential solutions require further significant technical design feasibility studies as part of a range of potential options for containment and remediation. Currently the effectiveness of these solutions could not be guaranteed and could potentially hasten the spread of contamination. Defence is currently investigating remediation options as a priority.

51. Defence, Hunter Water Corporation and the Port Stephens Council are members of the Storm Water Drainage Working Group.

52. Defence contributed approximately $168,000 to the Port Stephens Council to assist with flood mitigation measures in the areas around Moors Drain and under Lemon Tree Passage Road. A deed to support these works was signed between the two parties in early 2014, and payment was made in June 2014.

Army Aviation Centre Oakey

53. Defence has identified that groundwater beneath the Army Aviation Centre Oakey, and in an area off base, contains PFOS and PFOA associated with the historical use of fire-fighting foams used primarily during training activities.

54. Defence continues to be closely engaged with the community and relevant Government agencies to manage this issue.

55. Defence's priority remains the health and safety of Defence people and the nearby Oakey community. Defence is not an authority on drinking water quality.

56. Stage 2C of the environmental investigation commenced in July 2015. This involves: a hydro-geological assessment, including continued water sampling and groundwater modelling; a human health and ecological risk assessment, including sampling and testing of selected crops and animals; identifying and prioritising practical options for managing contamination sources and pathways in the future; and ongoing community engagement and updates.

57. Defence does not intend to conduct further blood testing in relation to PFOS or PFOA. This approach is consistent with that of the NSW Health Department, which recommends against it. The Queensland Health Department has not yet published any health guidance on PFOS or PFOA.

58. Further information is provided at Attachment B.

Other sites

59. AFFF was used for many years at a number of Defence facilities across Australia. Defence has undertaken a review of its estate to identify where it needs to undertake further investigations. This review considered two key factors:

a. where and how AFFF was used by Defence; and

b. the geography and hydro-geology of the base and surrounding area, and any information on the use of groundwater on or off base.

60. As a result of this review, Defence has identified three properties for the next tranche of environmental investigations. These are RAAF Base Pearce in West Australia, RAAF Base East Sale in Victoria and HMAS Albatross in NSW. Investigations at these sites will commence, following an activity to procure a contractor, in March 2016 and take around 21 months each.

61. Defence will undertake these investigations in accordance with the National Environment Protection (Assessment of Site Contamination) Measure Stage 1-2. Defence has made the following planning assumptions:

a. National Environment Protection (Assessment of Site Contamination) Measure Stage 1 environmental investigation is anticipated to take approximately three months; and

b. National Environment Protection (Assessment of Site Contamination) Measure Stage 2 environmental investigation is anticipated to take up to 18 months.

62. Defence intends to implement a rolling program of investigations at a further thirteen bases in 2016 and 2017, commencing at three bases every four months on a priority basis. This program will include extensive community engagement and will be informed by ongoing reviews and assessments of the Defence estate as we better understand this emerging contaminant.

Conclusion

63. Defence's priority remains the health and safety of Defence people and the nearby communities. Although Defence is not an authority on drinking water quality, in accordance with NSW Government advice Defence has reiterated NSW Health advice that residents refrain from drinking ground water within the affected area. Landholders and residents within the investigation area who use bore water for drinking water have been advised that they should contact Defence to discuss possible management strategies. Defence is currently providing safe drinking water to 30 properties near the base.

64. Stage 2B of the RAAF Base Williamtown environmental investigation commenced in October 2015. This involves: a hydro-geological assessment, including continued water sampling and groundwater modelling; a human health and ecological risk assessment, including sampling and testing of selected crops and animals; identifying and prioritising practical options for managing contamination sources and pathways in the future; and ongoing community engagement and updates.

65. Possible health impacts from long term exposure to PFOS or PFOA are not fully understood. The compounds are 'emerging contaminants' and, to date, research into the possible effects on human health is not conclusive. Defence does not intend to conduct blood testing in relation to PFOS or PFOA. This approach is consistent with the advice of the NSW Health Department.

Attachment A - Response to Specific Inquiry Terms of Reference

a) what contamination has occurred to the water, soil ands any other natural or human made structures in the RAAF Base Williamtown and the surrounding environs;

1. Investigations in 2011 at RAAF Base Williamtown identified soil and groundwater contamination as a result of past uses of Aqueous Film Forming Foams (AFFF) in fire fighting and fire training activities.

2. The environmental investigations have identified high concentrations of contamination on base at the old fire training pit and fire training pad, trade waste facilities, Lake Cochran, Sewage Treatment Plant and a former landfill.

3. The highest PFOS results were identified in groundwater south of Lake Cochran. There are detections also in surface water drainage channels off site, sediments along these channels and in some samples of small fish and grasses.

4. Results from the environmental investigations to date show that surface water and groundwater transported PFOS and PFOA off-base from identified sources on the base. Surface water can transport PFOS and PFOA via man-made systems (pipes and drains) and natural drainage systems (watercourses.) PFOS and PFOA in surface water can absorb into the sediment and soils within these systems and later be released.

5. Groundwater can also be a diffuse source, however it moves at a slower rate through underlying geological strata.

6. PFOS concentrations were detected in sediment and surface water samples collected several kilometres east-northeast and south of the Base. Off-Base vegetation samples reported low concentrations of PFOS, with PFOA and 6:2 FTS reported below the limit of reporting. The highest off-base concentration in vegetation was found close to the southeast corner of the base.

7. The highest PFOS and PFOA concentrations were reported in aquatic samples from Dawsons Drain. The lowest concentrations were reported for samples from Tilligerry Creek and Fullerton Cove.

b) the response of, and coordination between, the Commonwealth Government including the Department of Defence and RAAF Base Williamtown management, and New South Wales authorities to PFOS/PFOA contamination, including when base employees, local residents and businesses, Port Stephens and New Castle City Councils, and the New South Wales Environmental Protection Agency (EPA) were informed of the contamination;

8. A timeline of Defence's understanding of the contamination at RAAF Base Williamtown and its engagement with NSW authorities is provided in the following table.

Date	Activity	Comment
Pre 2003	Use of AFFF containing PFOS and PFOA	The 3M product containing PFOS and PFOA was generally in use as Defence's AFFF to respond to civilian and military aircraft accidents. On base at RAAF through various Environmental manager communications, there are concerns raised about the environmental impacts associated with fire training.
2003	Report: *Environmental issues associated with Defence use of Aqueous Film forming foam (AFFF)*	The report notes the risk for environmental contamination due to release of AFFF. The report identifies the hot fire training pit at RAAF Williamtown not having any controls to prevent spillage of fuel or AFFF flowing onto surrounding soil/grass areas.
2003	National Industrial Chemical Notification and Assessment Scheme	NICNAS recommends PFOS and related PFAS based chemical be restricted to essential uses such as Class B fire fighting foams. PFOS foams not to be used for training purposes.
2003	DEFAUST 5706 AFFF (Defence specification)	New specification covers the supply and testing of foam concentrates for controlling and extinguishing fires in hydrocarbons. The specification details the minimum standards for function and performance of class B foams. The specification is developed for inclusion in relevant Defence contracts such as supply contracts. The specification specifically excludes foam concentrate containing PFOS.
15 September 2004	Minute to CO 381 Environmental Compliance and Fire Section Activities	Minute notes that in 2003/04 Defence upgraded facilities where AFFF was used to ensure pollution control devices were in place to prevent environmental contamination. A tank is in place to collect AFFF contaminated wastewater from the fire training pad. Upgrade to Fire Training Area at Fire Section completed in April 2004. The minute advises that Air Force has ceased using 3M AFFF in training "until an alternative product is approved for use".
2004	Defence investigates alternative options for 3M product	There is a reference in CO381 Minute that CSIG is commissioning environmental and toxicological trials to replace the 3M product.
04 April 2006	Defence receives report: *Environmental Fate of New Fire Suppressing Products (Ansulite AFFF & 3M RF) compared to Light Water: A verification of Manufacturer's claims*	CRC CARE report confirms that Ansulite is less toxic than 3M lightwater product.
January 2006		Ansulite used in Fuel Farm Fire Suppression system upgrade at Williamtown.
May 2006	MBAS detection of surfactants	MBAS detection of anionic surfactants in groundwater at the Fire Training Pit and Fire Training Pad.
June 2007	Defence's guidelines	Environmental Management of AFFF products. The guidelines set out environment and engineering guidelines to manage risks associated with AFFF products in fire fighting. The procurement of 3M lightwater is prohibited.
August 2008	Defence finalises interim policy	*Aqueous Film Forming Foam Procurement and Use Interim* policy released: Requires AFFF product being procured not to contain PFOS or PFOA

Date	Activity	Comment
		The policy requires the use of AFFF to be managed to ensure it is not released to the environment. Facilities are to ensure capture and containment of waste water. Existing stocks of 3M lightwater are to be disposed of as soon as practicable.
November 2008	Defence Minute Replacement of 3M AFFF held within facility fire suppression systems	Requires 3M lightwater to be replaced across facilities with fire suppression systems DGLMS/OUT/2008/576 to Director General Regions and Bases advises method of replacement and what is to be done with the 3M lightwater
2009	DEF(AUST) 5706 Foam Liquid fire extinguishing 3% and 6% concentrate specification	Revised specification covers the supply and testing of foam concentrates for controlling and extinguishing fires in hydrocarbons. In 2009 the publication is revised to take into account Defence AFFF policy as well as specifically excluding foam concentrate containing PFOS.
2009	PFOS added to Stockholm Convention Annex	The Stockholm Convention characterises PFOS as: *PFOS is extremely persistent and has substantial bioaccumulating and biomagnifying properties, although it does not follow the classic pattern of other POPs [persistent organic pollutants] by partitioning into fatty tissues but instead binds to proteins in the blood and the liver. It has a capacity to undergo long-range transport and also fulfils the toxicity criteria of the Stockholm Convention.* The Stockholm Convention specifically provides that the production of PFOS for use in fire-fighting foam is an 'acceptable purpose'. To date (Dec 15), Australia has not ratified this amendment to the Stockholm Convention.
2009	Environmental Review of Fire Fighting Training and Facilities	This report is focussed on current use of Ansulite AFFF and recommends improvements to infrastructure to allow for improved on-site treatment and management, including improved bunding, installation of water treatment facilities and construction of a dedicated training pad for ARFF vehicles.
2009		PFOS and PFOA had been difficult to measure as 'most data was not based on validated methods'. Comparisons between different data sets difficult. Techniques for the measurement of PFOS and PFOA in environmental samples improve significantly.
December 2011	Routine monitoring	Routine monitoring includes testing for PFOS and PFOA. Monitoring finds two elevated detections on base. Prior to this, the levels of PFOS/PFOA were not known (due to inability to measure).
March 2012	GHD report of surface water results first quarter 2012	Results from routine monitoring finds elevated levels at 8 out of 12 locations on base and elevated levels in storm water exiting the base. Surface Water Samples collected in March identify elevated levels of PFOS in water leaving the base.
10 May 2012	Defence advised NSW EPA	Defence sends NSW EPA email on 02 May 12 advising of surface water detections off site. On 10 May 12 NSW EPA is verbally advised of PFOS/PFA elevated detections in surface water and that a detailed Stage 1 contamination investigation is to be undertaken.
20 January 2013	Defence letter to NSW EPA	Defence letter to NSW EPA notifying of contamination at effluent lagoons. Reports are

Date	Activity	Comment
		attached.
28 March 2013	NSW EPA letter to Defence	NSW EPA requests advice on Defence's management strategy for the contamination.
17 May 2013	Defence provides copy of Stage 1 report to NSW EPA	Stage 1 report is completed in March 2013 A copy is sent to NSW EPA on 17 May 2013. Stage 1 identifies potential contamination risks on the base such as the locations of former fire training facilities. Report provided recommendations for further sampling and analysis and was used to inform the scope of the Stage 2 investigation.
2013	Initial contractor engaged	Contractor goes into business liquidation.
April 2014	New contractor engaged	Stage 2 Environmental Investigation Commissioned.
May 2014	On site investigations	Sampling on site commences.
September 2014	Letter to NSW EPA and stakeholders	NSW EPA advised of commencement of Stage 2. Regional Manager – Graham Clarke. Stakeholders: Hunter Water Corporation; NSW EPA; Port Stephens Council; Department of Primary Industries (Office of Water); NSW Health (Hunter New England District); Newcastle Airport Limited; NSW Office of Environment and Heritage.
October 2014	Publicly available Website established Letter to NSW EPA (and stakeholders)	Site included: Flyer of drilling activities, FAQs, overview of project. NSW EPA - Adam Gilligan – Newcastle office advised of commencement of drilling and sampling program. Location map of proposed wells and FAQ provided as attachments. Stakeholders: Hunter Water Corporation; NSW EPA; Port Stephens Council; Department of Primary Industries (Office of Water); NSW Health (Hunter New England District); Newcastle Airport Limited; NSW Office of Environment and Heritage.
November 2014	Sampling and Drilling commenced off site	Total sampling on and off site: 185 groundwater samples 20 surface water samples 230 soil samples 35 sediment samples 30 vegetation samples 18 biota samples
14 May 2015	Stage 2 Project Technical Workshop	URS provides a verbal overview to Defence of preliminary data, indicating contamination on and off site. This data had not been quality checked or technically verified by the Technical Advisor at this time.
9 June 2015	Preliminary Stage 2 data received.	This data had not been quality checked or technically verified by the Technical Advisor.
12 June 2015	Defence Letter to Hunter Water Corporation (HWC)	Included preliminary Stage 2 groundwater data relevant to Hunter Water's operations.
23 June 2015	Preliminary Stage 2 Environmental Investigation Report received	Preliminary reports are reports that have not been quality checked or technically verified by the Technical Advisor. Typically these reports are not relied upon for community advice or formal decision making due to potential for significant errors being detected during quality assurance/technical verification stages.
23 June 2015	Preliminary Stage 2 Environmental Investigation Report sent to Technical Advisor	Report is technically complex and involves 40 maps and 51 pages of laboratory analysis.

3 August 2015	Draft Stage 2 Environmental Investigation report received in Defence	Draft report is one that has been quality checked and technically verified by the Technical Advisor ready for client and stakeholder comment. Results confirm elevated levels of PFOS/PFOA being detected on and off site.
4 August 2015	Draft Stage 2 Environmental Investigation report sent to stakeholders.	Hunter Water Corporation; NSW EPA; Port Stephens Council; Department of Primary Industries (Office of Water); NSW Health (Hunter New England District); Newcastle Airport Limited invited to a meeting on 12 August to discuss attached report and next steps. Provided proposed Power Point presentation to be provided to community on 2 September. Requested comments by 21 August.
12 August 2015	Defence holds stakeholder meeting to go through draft report.	Attendees, as above (except for NSW Health). Sought comments by 4 September 2015.
3 September 2015	NSW EPA advises Defence of precautionary measures	NSW EPA advises Defence that it is about to impose precautionary bans on fishing and oyster harvesting.
3 September 2015	EPA issues press release	NSW EPA press release announcing precautionary bans.
16 September 2015	Advice to industry reps and local reps	Defence met with industry leaders and local representatives ahead of the community forum.
16 September 2015	Community meeting	Defence held a community forum along with NSW agencies (including health, primary industries, NSW EPA) and Hunter Water Corp.
Sept – Nov 2015	Weekly telecons	Defence and NSW agencies hold weekly (then fortnightly) telephone conferences.
1 October 2015 and ongoing	Community Reference Group	Defence has attended all weekly formal meetings of the community reference group as well as community information sessions organised by the group.
8 October 2015 and ongoing	Elected Reps Reference Group	Defence has attended all formal fortnightly meetings of the Williamtown Elected Representatives Reference Group.
8 October 2015	NSW Government Williamtown Expert Panel Meeting	The NSW Government Williamtown Expert Panel extended the NSW EPA's investigation area. A revised map of the investigation area was issued by NSW EPA on 9 October 2015.
26 October 2015	Stage 2B Environmental Investigation Commenced	Defence commenced Stage 2B investigation.
27 October 2015	Fishing Ban Extended	Fishing ban extended by NSW EPA to June 2016.
4 November 2015	Financial Assistance Package Announced	Assistant Minister for Defence announced a financial assistance package for fishers affected by the NSW Government precautionary fishing closures in Fullerton Cove and Tilligerry Creek.
11 November 2015	Updated NSW EPA Advice	The NSW EPA updated its advice that, as a precaution, residents and young children should not swim in pools filled from private bores, or in local creeks, dams, drains and ponds in the Williamtown investigation area.

c) the adequacy of consultation and coordination between the Commonwealth Government, the New South Wales Government, Port Stephens and Newcastle City Council, the Department of Defence and Australian Defence Force, affected local communities and businesses, and other interested stakeholders;

9. Defence is committed to engaging with the communities near RAAF Base Williamtown on this matter. Defence has maintained a publicly accessible website for Williamtown since August 2014. Defence established a community hotline in August 2015. The technically verified Stage 2 Environmental Investigation Report was published on the project website on 15 September 2015.

10. Defence held a community meeting on 16 September 2015 to provide information in the Stage 2 Environmental Investigation. This was attended by Hunter Water Corporation and NSW agencies including the NSW EPA and the Department of Health.

11. Defence is a member of the NSW Government's Williamtown Contamination Investigation Community Reference Group. This group is chaired by a senior official from the NSW Department of Premier and Cabinet and includes representatives from NSW agencies, industries such as fishing and agriculture and community members. Defence has attended all formal meetings and community information sessions held by the group.

12. The NSW Parliamentary Secretary for the Hunter and Central Coast chairs a fortnightly meeting of elected representatives. Defence attends these meetings.

13. The Senior ADF Officer Williamtown has maintained fortnightly updates to RAAF Base Williamtown stakeholders. This email correspondence is sent to all community, Council, State and Commonwealth representatives.

14. Defence is not a member of the NSW Government's Williamtown Expert Panel, and does not have access to the information being used for its considerations and its advice to the NSW EPA. Defence attended part of one meeting at the Panel's request to provide an update on Defence's activities.

15. The NSW Government's Williamtown Expert Panel has established three working groups. Defence has attended three meetings of the Risk Assessment Working Group and one meeting of the Water Working Group.

16. Defence has provided the NSW EPA with all verified results from Defence's investigations.

17. Defence has consistently asked the NSW EPA for information on its testing activities in order to understand the methodology used and to add to the knowledge being gained through Defence's testing. Further, Defence would like to use this information to create a single combined map of activity and results in order to inform the ongoing investigations and to provide a more coherent picture to the community and stakeholders. Defence has received some preliminary data from the NSW EPA on the results of its testing in the investigation zone.

18. Defence is working with the NSW EPA to establish a common site where a single combined map of activity and results can be published.

19. Defence is participating in a Commonwealth interdepartmental working group chaired by the Department of Environment, looking at the implications of this contaminant. Other agencies involved include the Department of Infrastructure, Air Services Australia, the Department of Health, the Department of Agriculture and Water Resources and the Department of the Prime Minister and Cabinet.

d) whether appropriate measures have been taken to ensure the health, wellbeing and safety of Australian military and civilian personnel at RAAF Base Williamtown;

20. Defence understands that the primary pathway for ingestion of this product is through drinking water or eating food containing these chemicals. As RAAF Base Williamtown is connected to the Hunter Water Corporation's water supply, and this is shown through Hunter Water Corporation's testing to be free of PFOS and PFOA, people are not exposed to this through drinking water on base.

21. Given that Defence used AFFF widely from the 1970s to the early 2000s, there is no accurate way to assess the exact number of Defence personnel who may have been exposed to PFOS and PFOA.

22. Defence personnel can access the Defence Exposure Evaluation Scheme (DEES). The DEES is open to current and former employees of the Department of Defence and Australian Defence Force cadets who suspect that they have been exposed to a hazard.

e) the adequacy of health advice and testing of defence and civilian personnel and members of the public exposed, or potentially exposed, to PFOS/PFOA in and around RAAF Base Williamtown;

23. The possible impact on human health of PFOS/PFOA is unknown. The National Health and Medical Research Council does not specify a level for these chemicals in the updated 2015 National Australian Drinking Water Quality Guidelines.

24. There are no globally accepted peer reviewed studies showing that exposure to PFOS and PFOA affect human health. Defence also understands there are no specific health conditions which have been globally accepted to be directly caused by exposure to PFOS or PFOA. As a result, there are no particular health conditions that could be screened for in a health check.

25. As there are no national health guidelines relating to PFOS/PFOA, Defence relies upon advice in each state. In relation to RAAF Base Williamtown and surrounds, Defence refers to advice published by the NSW Department of Health and other NSW agencies in relation to PFOS and PFOA.

26. The NSW Department of Health does not recommend blood testing for PFOS and PFOA because there are no particular health conditions that can be screened for in a health check.

f) the adequacy of Commonwealth and state and territory government environmental and human health standards and legislation, with specific reference to PFOS/PFOA contamination at RAAF Base Williamtown

27. Studies in America have shown that almost everyone is exposed to low levels of PFOS and PFOA just by living in the modern world. Perfluorinated compounds (PFCs) have been used for many years in a wide variety of common household and industrial products such as clothing, furniture, adhesives, food packaging, heat-resistant non-stick cooking surfaces and the insulation of electrical wire.

28. Long term, large scale health studies of workers in the USA exposed to high levels of these chemicals do not show chronic health effects. Defence understands there are no specific health conditions which have been globally accepted to be directly caused by exposure to PFOS or PFOA.

29. Australia does not currently have standard health or ecological guidelines for PFOS and PFOA. Various guidelines have been set by a number of countries but there remains a lack of a uniform approach on these guidelines. In the absence of such standards, Defence has chosen to use Provisional Health Advisory (PHA) guidelines, developed in 2009 by the US Environmental Protection Agency Office of Water for its environmental investigations under the NEPM.

30. The National Health and Medical Research Council does not specify a level for these chemicals in the Australian Drinking Water Quality Guidelines updated in March 2015. Defence is not an authority on drinking water quality. However, as a precaution, Defence has reiterated NSW Health advice that residents refrain from drinking ground water within the contamination investigation area.

31. Defence is represented on the enHealth which is a standing committee of the Australian Health Protection Principal Committee (AHPPC.) Defence participated in an enHealth summit on 11 December 2015 which addressed the issue of PFOS and PFOA.

32. The NSW Department of Health does not recommend blood testing for PFOS and PFOA because there are no particular health conditions that could be screened for in a health check. The Queensland Department of Health has not put out a public statement on this matter.

g) what progress has been made on remediation works at RAAF Base Williamtown, and the adequacy of measures to control further Contamination;

33. There is a limited amount of information available about remediation techniques for PFOS and PFOA contamination. Defence is consulting environmental consultants who are best placed to provide advice and best practice in this area.

34. Defence is also pursuing other research options as well as working with industry. Defence has met recently with CRC CARE to discuss remediation options.

35. In 2014 Defence requested industry advice on global best practices and was provided with the following: *Fire Fighting Foams with Perfluorochemicals – Environmental Review*, Seow, June 2013; and, the US EPA *Emerging Contaminants – PFOS and PFOA* Fact sheet, May 2012. The US EPA fact sheet discussed several remediation options, but noted that due to unique physiochemical properties, PFOS and PFOA resist most conventional treatment technologies, and that optimal treatment methods often depend on site specific conditions.

36. Based on that information, in 2015 Defence engaged a consultant to provide advice on current remediation technologies and research being conducted in Australia. The advice from that consultant is that only four treatments for soil contamination could work on a field scale.

37. The consultant advised that more detailed research and trials were underway to develop new technologies. The consultant conducted a limited literature review which identified possible remediation techniques that had been used for other contaminated groundwater remediation, but that those approaches required high energy inputs and that it is likely a hybrid of remedial technologies and management practices would be required by Defence.

38. RAAF Base Williamtown is a 986 hectare site comprising 7 stormwater catchment areas, which are designed to take water from Newcastle Airport and the base into the off-base drains. Defence does not currently have, nor has it received advice from any other agencies of, a feasible solution to contain the surface water runoff. The topography of the area and the high water table present challenges for containing surface water run off.

39. Remediation of ground water on a large scale is problematic and a proven technology is not available to effectively remediate aquifers. Currently at RAAF Base Williamtown, where ground water is being extracted to facilitate construction activities, the water is being treated through a water treatment plant prior to being re-injected into the aquifer. However, this is extracted ground water, not ground water *in situ* in the aquifer, and it is on a limited scale.

40. Defence continues to work with industry to determine appropriate remediation technologies for ground water.

Current construction works

41. Defence, through the New Air Combat Capability project (NACC), has engaged environmental consultants Environmental Earth Sciences (EES) to conduct soil and water testing across the NACC project area. EES developed a Sampling and Analysis Plan (SAP) for the project, and conducted soil and groundwater testing ahead of bulk earthworks.

42. The results of the soil testing in the NACC project area and South East runway area has identified very low level PFOS and PFOA contamination in 85% of soil

43. Earthworks associated with the NACC project mainly involves the stripping of topsoil to get down to stable ground suitable for construction. Excavation for this work is typically down to 300mm only.

44. In accordance with levels agreed by the NSW EPA, Defence is able to remove soil containing low concentrations of PFOS/PFOA as general solid waste. Soil containing PFOS and PFOA higher concentrations will be stockpiled on site ensuring that the material is appropriately contained or encapsulated. These stockpiles have levels of PFOS and PFOA below the residential screening criteria, and are intended for re-use on site, in accordance with NSW EPA agreement.

45. The stockpiled material is being placed on a physical barrier of geofabric material to prevent cross contamination of the underlying soil and has been covered with a further physical barrier to prevent rain leaching out contaminants into surrounding area. Sediment control fences are in place and the stockpiles are regularly inspected to assess the condition of the stockpiles and physical barriers.

46. Normal measures for dust suppression, erosion and sediment control are in place to prevent dust blowing offsite and sediment being washed into the stormwater system.

47. Water testing ahead of construction activities has identified low level PFOS and PFOA contamination in groundwater across the construction area. In the areas where the groundwater impacts upon construction activities dewatering activities are required. Where PFOS concentrations are found to exceed the DCD #8 Drinking Water interim screening criteria specialist contractors have been engaged to treat groundwater encountered in these areas.

48. Two water treatment plants have been commissioned by the NACC project. These plants are used to treat groundwater during dewatering activities where PFC concentration is higher than the drinking water interim screening level. Water is treated to below the drinking water interim screening level before being discharged onto the ground as close to the dewatering location as possible, in accordance with EPBC Act guidelines?.

49. Where the groundwater has PFC concentrations below the drinking water interim screening criteria the dewatering activities can proceed with the water being discharged onto the ground, as close to the dewatering location as possible, without treatment. Dewatering is not being discharged off site via the stormwater system.

50. The project's environmental consultants have carried out tests and modelling to assess the effects of the project's dewatering and discharge practices on contamination levels and groundwater movement across the Base. This assessment

51. The stormwater design for the project is such that it will avoid areas of contaminants. The site is very flat and has very porous soils; as such no significant volumes of stormwater runoff are generated from the project areas.

52. No stormwater from the NACC project is directed towards Lake Cochran and the stormwater flow is being managed by a series of detention ponds constructed by the project. There is no net increase to the rate of stormwater discharged from the Base.

53. Within the Stage 2B Environmental Investigation program, source areas identified in the Stage 2 investigation will be further assessed and remediation strategies considered.

h) what consideration has been undertaken of financial impacts and assistance to affected business and individuals.

54. On 4 November 2015, the Commonwealth Government announced a financial assistance package for individuals and businesses impacted by the NSW Government fishing ban imposed in the Williamtown area. Commercial fishers who derive the majority of their income from areas affected by the bans may be eligible for an Income Recovery Subsidy equivalent to Newstart or Youth Allowance, a Business Assistance Payment of $5,000, and Business Hardship Payments of up to $20,000. This package is being delivered by the Department of Human Services who are supporting fishers and members of the affected community to complete claims for financial assistance.

55. Defence is unaware of any land-based primary producers affected by the contamination in the investigation zone. Primary producers have not been advised to stop using bore water to water vegetables or crops, or as drinking water for stock.

Attachment B - Army Aviation Centre Oakey (AACO) Background

Contamination

56. Initial routine environmental investigations into potential hydrocarbon contamination at Army Aviation Centre Oakey were undertaken in 2010, followed by a more comprehensive investigation in 2011. These investigations identified the presence of PFOS and PFOA within soil and ground water.

57. Progressive investigation and assessment activities to determine the extent of contamination, identify potential receptors and pathways, and assess the risks to human health and the environment, have continued at properties both on and off the Army Aviation Centre Oakey.

58. Defence has held six community information and consultation sessions in Oakey, the latest on 4 December 2015.

Blood Testing of Community Members

59. In late 2014 Defence wrote to residents located within the detection area inviting them to nominate to participate in a limited blood testing program. This testing was not intended to be available to all residents and the letter set clear eligibility criteria.

60. In May 2015 Defence engaged a pathology company to facilitate collection and analysis of up to 100 blood samples from those who met eligibility criteria.

61. Testing was provided to a limited number of people who self nominated and met the criteria of living on properties within the detection area, with their bore results indicating elevated levels of PFOS or PFOA, and who had consumed ground water in the last three years. Other people were permitted to participate in the testing on a case-by-case basis.

62. At a public meeting in Oakey on 25 August 2015 residents were advised that all blood samples had been sent and batched for analysis by the testing laboratory, and that residents would receive their results in September 2015. Residents were sent their individual results from 14 September 2015.

63. A total of 75 samples were analysed.

64. Defence does not intend to conduct further blood testing or fund wider health monitoring in relation to PFOS or PFOA. This approach is consistent with that of the NSW Health Department, which recommends against blood testing. The Queensland Health Department has not published any guidance on blood testing for PFOS or PFOA.

Current Activities and Scope of Work

65. Stage 2C works have started at AACO. Stage 2C works include:

- hydro-geological assessment;
- identifying and prioritising management of contamination pathways;
- Community engagement and updates; and
- human health and ecological risk assessment.

66. The hydro geological assessment includes:

- sampling of drainage lines, creeks and irrigated soil in the investigation area;
- installing 20 new ground water monitoring wells on and off base and sampling of ground water from these wells;
- re-sampling of specific existing offsite bores;
- ground water modelling; and
- a hydro-geological assessment report, including predictions of the migration of the ground water contamination.

67. Identifying and prioritising practical options for managing contamination pathways includes:

- literature review of current PFC remediation / management options available; and
- assessment of the feasibility of remediation / management options for AAC.

68. Ongoing community engagement and updates includes:

- management of a community hotline and project email address;
- drafting FAQS and project updates / fact sheets;
- community information sessions, approximately 6 monthly;
- key stakeholder roundtables (as required);
- direct communication with landholders (property access and test results letters, stakeholder meetings, letter box dropped project updates); and
- water use surveys.

69. The objectives of the human health and ecological risk assessment are to assess the potential risk to identified human health and ecological receptors at the AACO and surrounding area where PFCs have been detected in ground water.

70. In accordance with the Queensland *Environmental Protection Act* 1994 the human health and ecological risk assessment will follow the recommended approach of the National Environment Protection (Assessment of Site Contamination) Measure

71. In order to characterise potential risks, the human health and ecological risk assessment will identify toxicity reference values with consideration of a literature review conducted by a specialist toxicologist and compare these with exposure point concentrations estimated from measured concentrations of PFCs in the environment relevant to the identified human and ecological receptors.