

## Myra Thompson

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**From:** Blain, Helen MS <helen.blain@defence.gov.au>  
**Sent:** Thursday, 6 August 2015 3:27 PM  
**To:** Penny Hutchinson; Sophie Dwyer  
**Cc:** Klein, Mathew DR  
**Subject:** RE: Briefing of General Practitioners Oakey re PFOS PFOA contamination - Thursday next week [SEC=UNCLASSIFIED]

**Importance:** High

UNCLASSIFIED

Dear all

We have received advice from Dr John Hall that Tuesday evening is no good. His recommendation is for Thursday at 11.30 at his practice - this is a time he schedules for catch ups with many doctors from his group. It would be great if you could make this time?

Mathew and Penny please advise on your availability. It is most important that this briefing takes place as soon as possible.

thanks helen

**Helen Blain**  
**Acting Assistant Secretary**  
**Environment and Engineering Branch**

---

**DSRG Infrastructure Division | DEPARTME**

Ph: 02 6266 8052 | Fax: 02 6266 8077 | Mob:  Address: BP26-2-B001 | PO Box 7925 | Canberra BC 2610

Email: [Helen.Blain@defence.gov.au](mailto:Helen.Blain@defence.gov.au)

Website: [www.defence.gov.au/environment](http://www.defence.gov.au/environment)

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Hi Matthew

Would you please advise the format you plan to use at the briefing?

Regards

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Rachel here is looking through them yellow pages and an approach to this may be to contact each major practice by email and phone and advise of a briefing time in Toowoomba. Grateful for your views - we could try to do this one also on the Tuesday. Do you have any thoughts on place and time?

Thansk helen

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Best wishes Helen  
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**Cc:** Peter Bristow; DDHHS; Michael Bishop, Hwee Sin Chong  
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Good Morning Penny

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Dear Penny

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As a matter of urgency, I'm keen to arrange for the GP briefings in Oakey as soon as possible within the next two weeks in readiness for residents tested to receive their results. We will be contacting the Commonwealth Chief Medical Officer to seek his assistance in this. Grateful if you could forward a list of the GPs in the Oakey area please and any suggestions for a preferred date within the next two weeks that would suit the representative of Queensland Health.

Many thanks Helen

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Dear Helen

My colleague, Peter Boland, Manager of Environmental Health here at the PHU has asked me to pass on his queries (see attached).

Kind regards

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This work has not been mentioned by the DoD in their recent dealings with Queensland Health (QH).

Is it possible to seek an update from the DoD on the scope and status of the AECOM work? Timings mentioned at the community meeting suggested that the human health risk assessment was to be completed by the end of 2014 with updates to validate the findings in 2015, following further environmental testing.

Thanks,  
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**Sent:** Thursday, 6 August 2015 4:03 PM  
**To:** 'johnhall@downsruralmedical.com.au'; 'deniseblack@downsruralmedical.com.au'  
**Cc:** Sophie Dwyer; Penny Hutchinson; Cuddihy, Rachael MS 1; Klein, Mathew DR; Callinan, Scott MR 1; Pearce, Vicki MISS 1; Simpson, Samantha MRS; O'Connell, Mark MR 2  
**Subject:** Briefing from Defence regarding PFOS PFOA contamination at Oakey - Thursday 13 August 11.30 [SEC=UNCLASSIFIED]

### UNCLASSIFIED

Dear Dr Hall

Many thanks for your discussions and arrangements with Rachel Cuddihy from this office. I understand that you and your staff are available on Thursday 13 August at 11.30 next week at your practice in Oakey at 5 Cherry street to have a discussion with our Defence Dr Mathew Klein about PFOS PFOA. Please consider this arrangement confirmed.

#### Background

As you may know Defence has funded some blood testing of residents in the Oakey area who have been potentially exposed to PFOS PFOA contaminants through drinking ground water. The analysis of the bloods is being done by Entox in Brisbane and it is expected that results will be released in coming weeks to residents. Ahead of the release of the results Defence's Dr Mathew Klein, Senior Medical advisor, Occupational Health and Environmental Medicine, together with Dr Penny Hutchinson, Queensland Health would like to brief local doctors in Oakey in the event that residents seek advice on this issue from their general practitioners. Defence has been engaging with Queensland Health who have provided your email address to us. Unfortunately Dr Hutchinson is not available for Thursday but has suggested that we proceed with the briefing rather than delay further.

Thank you so much for your making time available next week.  
With very best wishes

Helen

Helen Blain  
Acting Assistant Secretary  
Environment and Engineering Branch  
Department of Defence  
ph 02 62668052  
fax 02 62668077  
mobile

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## Suzanne Huxley

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**From:** Suzanne Huxley  
**Sent:** Monday, 27 June 2016 9:52 AM  
**To:** Penny Hutchinson  
**Cc:** Sophie Dwyer  
**Subject:** Counselling at Oakey

Hi Penny

Have you had anything to do with the counselling sessions being made available at Oakey? Sophie was wondering if a record of the number of individuals accessing the service will be collated. If not, who do you suggest I contact regarding this enquiry?

Thanks

Suzanne

Dr Suzanne Huxley  
Senior Medical Officer  
Health Protection Branch  
Prevention Division  
Ph: 3328 9606

RTI Release

## Suzanne Huxley

---

**From:** GOUDIE Steve <Steve.Goudie@dnrm.qld.gov.au>  
**Sent:** Wednesday, 27 April 2016 8:58 PM  
**To:** Pearce, Vicki MS 1  
**Cc:** Virginia Berry; SANDERS Paul; Adrian Jeffreys; CHAVASSE Jason; Penny Hutchinson; ROUTLEY Richard; MILLER Elton; CONNOR Andrew; HILL Chris; Don Bletchley; GLEESON Kelly; Sophie Dwyer; Suzanne Huxley  
**Subject:** Re: Papers for joint Oakey IDC / Department of Defence meeting, 28 April 2016 [SEC=UNCLASSIFIED]

Vicki

Paul Sanders, Jason and I also discussed this, this afternoon. We had not expected this to be a full IDC. I doubt others will be that interested in these specific issues. But all are certainly welcome

Steve

Sent from my iPhone

On 27 Apr 2016, at 8:26 PM, Pearce, Vicki MS 1  
<[vicki.pearce1@defence.gov.au](mailto:vicki.pearce1@defence.gov.au)<<mailto:vicki.pearce1@defence.gov.au>>> wrote:

UNCLASSIFIED

Hi Virginia,

I misunderstood the intent of the meeting tomorrow. I anticipated that it was a meeting with DNRM facilitated by DPC rather than an actual IDC. Noting that the agenda generally relates to the DNRM queries I am not sure it makes a fundamental difference but consider that it was worth mentioning as additional Defence representatives would have attended had I realised.

regards

Vicki Pe

Mobile:

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From: Virginia Berry [<mailto:Virginia.Berry@premiers.qld.gov.au>]

Sent: Wednesday, 27 April 2016 2:53 PM

To: SANDERS Paul; Adrian Jeffreys; [Steve.Goudie@dnrm.qld.gov.au](mailto:Steve.Goudie@dnrm.qld.gov.au)<<mailto:Steve.Goudie@dnrm.qld.gov.au>>;

[Jason.Chavasse@dnrm.qld.gov.au](mailto:Jason.Chavasse@dnrm.qld.gov.au)<<mailto:Jason.Chavasse@dnrm.qld.gov.au>>; Pearce, Vicki MS 1; Penny

Hutchinson; ROUTLEY Richard; 'MILLER Elton'; 'CONNOR Andrew'; 'HILL Chris'; Don Bletchley; GLEESON Kelly; 'Sophie

Dwyer'; [Suzanne.Huxley@health.qld.gov.au](mailto:Suzanne.Huxley@health.qld.gov.au)<<mailto:Suzanne.Huxley@health.qld.gov.au>>

Subject: Papers for joint Oakey IDC / Department of Defence meeting, 28 April 2016

Good afternoon.

Please find attached the Agenda for tomorrow's meeting and the paper for Item 2.



For attendees who will be dialling in, the details are included in the Agenda.

If you have any questions, please call me on (07) 3003 9357.

Regards, Virginia Berry

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RTI Released

## Suzanne Huxley

---

**From:** Penny Hutchinson  
**Sent:** Friday, 18 March 2016 3:30 PM  
**To:** Suzanne Huxley; CDU ESO; Andrew Langley; Bhakti Vasant; Brad McCall; Candice Colbran; Catherine A Quagliotto; James K Smith; Kari Jarvinen; Katie Panaretto; Kerryn Coleman; Madhumati Chatterji; Mandy Seel; Margaret Young; Megan Young; Paul Gaston Van Buynder; Richard Gair; Rosanne Muller; Satyamurthy Anuradha; Steven Donohue; Susan Vlack  
**Subject:** RE: Oakey GPs and Oakey Fact Sheet

Thanks Suzanne.

Regards  
Penny

-----Original Message-----

**From:** Suzanne Huxley  
**Sent:** Friday, 18 March 2016 8:15 AM  
**To:** CDU ESO; Andrew Langley; Bhakti Vasant; Brad McCall; Candice Colbran; Catherine A Quagliotto; James K Smith; Kari Jarvinen; Katie Panaretto; Kerryn Coleman; Madhumati Chatterji; Mandy Seel; Margaret Young; Megan Young; Paul Gaston Van Buynder; Penny Hutchinson; Richard Gair; Rosanne Muller; Satyamurthy Anuradha; Steven Donohue; Susan Vlack  
**Subject:** Oakey GPs and Oakey Fact Sheet  
**Importance:** High

Morning All

Please be aware that neither of these fact sheets has been approved by the Department of Health for distribution. This is in line with the Queensland Government position regarding the management of the Oakey groundwater, which is the responsibility of the Department of Defence.

Regards

Suzanne

-----Original Message-----

**From:** CDU ESO  
**Sent:** Friday, 18 March 2016 7:57 AM  
**To:** Andrew Langley; Bhakti Vasant; Brad McCall; Candice Colbran; Catherine A Quagliotto; James K Smith; Kari Jarvinen; Katie Panaretto; Kerryn Coleman; Madhumati Chatterji; Mandy Seel; Margaret Young; Megan Young; Paul Gaston Van Buynder; Penny Hutchinson; Richard Gair; Rosanne Muller; Satyamurthy Anuradha; Steven Donohue; Susan Vlack; Suzanne Huxley  
**Subject:** Emailing: Att 3 DoH Advice to GPs final, ATT2 PFC Oakey Factsheet, Attachment - DefenceFactSheet3August2015, Blood Levels US guideline, Extent of PFOS plume Oakey, extent of plume PFOA Oakey, FW Docs for F2F, FW PHPf2f Agenda 2016 March FINAL, List of ref  
**Importance:** High

Dear All

Please see attached papers for the F2F. These documents are also saved on the shared drive:

s.73 irrelevant - file path

Thanks

Maria

RTI Release



Australian Government

Department of Defence  
Defence Support and Reform Group

# Army Aviation Centre Oakey Groundwater Investigation

## Frequently asked questions

### About the investigation

#### Q What is the investigation about?

The Department of Defence (Defence) is undertaking a long-term environmental investigation and assessment of the groundwater beneath the Army Aviation Centre Oakey (AACO) base and surrounds.

The initial investigation involves targeted sampling and testing of local water bores to the west and south-west of the base and desktop studies.

It is anticipated the investigation may take several years to complete. The purpose of the investigation is to understand how groundwater may have been impacted by fire-fighting foams, used as part of training activities on the AACO between 1970 and 2005.

These foams contained perfluorooctane sulphonate (PFOS) and perfluorooctanoic acid (PFOA).

The information collected will assist Defence to understand the groundwater impacts and contribute to developing appropriate management strategies in relation to any potential human health and ecological risks.

#### Q How did Defence know there might be PFOS and PFOA in the groundwater outside the AACO?

In 2010, Defence found evidence of PFOS and PFOA in the groundwater beneath the AACO base. Defence completed further assessments of the groundwater system and the results indicated the impact may have travelled further afield, beyond the AACO.

Defence completed limited targeted water sampling in early 2013 with wider scale testing beyond the AACO perimeter occurring from early 2014, as part of the evolving process to determine the extent of the impact.

#### Q What are PFOS and PFOA used for?

PFOS and PFOA have been used for many years in a wide variety of common household and industrial products such as cleaning products, textiles and paper and packaging products and are therefore present at trace concentrations throughout the environment.



**Q Are there potential human health impacts of PFOS and PFOA?**

PFOS and PFOA are labelled as 'emerging contaminants' because regulatory standards both here and abroad are in their infancy and/or are evolving due to new science and information being generated.

To date there has been limited research completed or published in Australia and/or overseas, which conclusively confirms a known link between exposure to these chemicals and the possible associated health impacts of these chemicals via the exposure pathways identified in Oakey.

Defence is aware that there are high profile, international legal proceedings, and associated research studies relating to these chemicals, for example, the West Virginia/Ohio - C8 Health Panel Epidemiological Study ([http://www.c8sciencepanel.org/prob\\_link.html](http://www.c8sciencepanel.org/prob_link.html)). However, the findings of this health study could have been impacted by many location- and population-specific factors (e.g. routes of exposure, background conditions and lifestyle factors), which cannot necessarily be translated to the Oakey community. In addition, many factors can influence a person's health and therefore it is challenging to link a person's health issue unequivocally to PFOS and PFOA exposure.

Research in Australia and overseas continues to be undertaken. Defence is actively engaged with industry professionals to review the information from these studies and its applicability to the site conditions.

As a precaution, Defence recommends residents within the investigation area do not drink any water sourced from underground water bores within the investigation area.

Further assessment of potential health impacts and risks associated with other uses of the groundwater will be undertaken as part of the investigation.

**Q What is the 'detection area'?**

The 'detection area' is a map showing our current understanding of the area where PFOS contaminated groundwater has been detected at Oakey. This is inferred from bore sample results and may change with time as more samples are tested.

**Q What is the 'investigation area'?**

The 'investigation area' is the broader area beyond the detection area, which is being studied as part of assessing the extent of the contaminated groundwater. The may change with time as more information becomes available.

**Q What health guidelines are used as a basis for assessing reported PFOS and PFOA concentrations?**

Australia currently has no guidelines for assessing reported PFOS and PFOA concentrations in drinking water. From August 2014, Defence is using Provisional Health Advisory (PHA) values developed in 2009 by the US Environmental Protection Agency (EPA). The PHA guidelines represent a concentration above which action should be taken to reduce exposure to PFOS and PFOA in drinking water. The PHA value for PFOS is 0.2 µg/L. The PHA value for PFOA is 0.4 µg/L.



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**Q How will landholders and residents be kept informed about the project?**

Defence is committed to regularly updating the community throughout the investigation.

The project website will be updated as the investigation progresses. Community information sessions, direct mail and information sheets will occur as required.

Enquiries or requests relating to individual properties will be assessed on a case-by-case basis.

Landholders and residents can contact the project team by emailing [defence.oakey.anz@aecom.com](mailto:defence.oakey.anz@aecom.com) or calling 1800 136 129 (8.30am – 5pm, weekdays).

**Q Can I drink the groundwater from my water bore?**

As a precaution, Defence recommends not drinking water from any underground sources (i.e. bore water) within the investigation area until further notice. This includes boiled groundwater.

Landholders and residents within the investigation area, who use groundwater for drinking water or household use, should contact Defence in order to discuss possible management strategies. Each household's drinking water requirements will be assessed on a case-by-case basis to select the most appropriate assistance that Defence may be able to provide.

Defence will continue to work cooperatively with all relevant stakeholders including those from Commonwealth, State and local government agencies to implement appropriate management strategies.

**Q What should I do if my only source of drinking water is from a rainwater tank?**

Landholders or residents within the project's investigation area whose only source of drinking water is from a rainwater tank should contact Defence.

General advice about drinking water from rainwater tanks can be found on the Department of Health website:

- [Guidance on use of rainwater tanks](#)
- [Roof-harvested rainwater and protection of public health](#)

**Q Can I continue to use the groundwater to water my crops or livestock?**

Defence does not have any information which indicates that using groundwater for irrigation of crops and watering livestock should cease.

Should additional information, to be gathered through Defence's ongoing investigations, change this position, landholders and residents will immediately be informed.

**Q Will the investigation include soil testing?**

Defence is focussing its efforts on understanding any potential health impacts at this stage of the investigation. Following further delineation of the groundwater impacts and identification and



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implementation of appropriate management strategies, Defence may undertake soil investigations if they are determined necessary.

**Q Will Defence pay for my drinking water?**

Each household's drinking water requirements will be assessed on a case-by-case basis to select the most appropriate assistance that Defence may be able to provide.

Landholders and residents within the investigation area, who use groundwater for drinking water, should contact Defence in order to discuss possible management strategies.

**Q If Defence is assisting me to access an alternate drinking water source to bore water, how long will this continue?**

The length of time this assistance will be provided will depend on:

- The outcomes of the investigation, including the associated risk assessment and management strategies selected for potential health and ecological risks.
- Each household's situation, water use and available access options, which will be assessed on a case-by-case basis.

Each landholders'/ residents' existing water access arrangements will be reviewed as more information is collected over the life the project. Defence will contact you directly about any proposed changes to these arrangements.

This is a long-term environmental investigation, which may take several years to complete.

**Q Will Defence provide compensation for loss of income to business-owners/ operators, where detections of PFOS and PFOA have been found (e.g. livestock and crop sales)?**

Defence does not have any information at this time, which indicates that using groundwater for watering stock and irrigating crops, including commercial purposes, should cease.

At present, there is no basis for Defence to compensate business-owners/ operators for loss of income, or any other loss.

This is a long-term environmental investigation and assessment. The information collected by Defence will assist it to understand the groundwater impacts and develop appropriate management strategies in relation to any potential human health and ecological risks.

**Q Will PFOS and PFOA detections have an impact on property values?**

Defence does not have any information at this time, which indicates that values of the properties within the investigation area have been diminished.



## Groundwater assessment and test sites

### Q How are the groundwater test sites selected?

The groundwater test sites are selected based on:

- the current understanding of groundwater flow direction
- results from previous sampling/ testing
- technical advice about the most likely movement of the impact.

In order to estimate the extent of the groundwater contamination, not every water bore within the investigation area will need to be tested. The location of future sample/ test sites will be informed by the data gathered to date and the technical information needed to progress the investigation and assessment at the time.

Defence will contact landholders and/or residents whose water bores are identified as a potential sample/ test site.

### Q How long will the project team need to be on my property to undertake groundwater sampling?

Currently only existing water bores are being tested. The sampling process will take approximately 30 minutes to one hour, depending on bore accessibility. Please allow additional time, if multiple water bores are to be tested.

### Q What does the testing involve?

Groundwater samples are collected in plastic containers provided by an independently accredited commercial laboratory. The samples are sent back to the laboratory in these containers for analysis. Testing by the laboratory is conducted using standard analytical methods (i.e. US EPA).

### Q What will happen if I want my groundwater tested, but my property has not been selected for testing?

Landholders or residents within the investigation area should contact the project team directly regarding requests for groundwater testing.

Not all water bores within the investigation area need to be tested in order to determine the extent of the groundwater contamination. Requests will be assessed on a case-by-case basis which takes into account the specific circumstances of the landholder and the requirements of the project.

The location of future sample/ test sites will be informed by the data gathered to date and the technical information needed to progress the investigation and assessment at the time.



# Oakey Army Aviation Centre contamination incident

Information for Medical  
Practitioners

## Key Points

Residents living in some areas adjacent to the Oakey Army Aviation Centre have been alerted to potential exposures to perfluorinated chemicals (PFCs).

Health effects are not expected but the potential for adverse health effects cannot be excluded.

## Exposure of Residents

Blood testing of some of these residents for perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA) and perfluorohexanesulfonic acid (PFHxS) was undertaken by S&N Pathology, as part of an agreement with the Department of Defence. Results of these blood tests have been distributed directly to the individuals in the week commencing 14 September 2015.

It is possible that residents will present with health concerns for further assessment. Blood tests are not helpful in predicting the level of health risk, are not readily available and are not recommended.

## Advice to Residents

Queensland Health advises that residents in the potentially affected area should not drink or prepare food with bore water. While the exposure is likely to be low, residents have also been advised to consider avoiding consumption of eggs or drinking milk from animals raised on their own property and avoiding consumption of fish caught from Oakey Creek, downstream from the Army Aviation Centre.

It is safe to drink water from the reticulated water supply (town water) and to consume commercial produce from the Oakey area.

Ongoing investigations by the Department of Defence are expected to provide further information on the likelihood of exposure to PFCs from sources other than groundwater.

## Source of Contamination

Between 1970 and 2005 the Department of Defence used fire-fighting foam containing PFOS and PFOA at the Oakey Army Aviation Centre on the Darling Downs. PFCs are present on the site, and over the past decades have slowly worked their way through the soil to the groundwater underneath the site and contaminated land close to the site. The Department of Defence is undertaking environmental monitoring to determine the extent of the contamination.

## Health Effects

There are no acute health effects reported to be associated with exposure at levels observed at Oakey.

There is also no conclusive evidence, at this stage, which links exposure to these chemicals with long term adverse health effects in humans, such as cancer. Some studies have shown changes in serum lipids and other biochemical indicators which are related to the blood levels of PFOS, PFOA and other PFCs.

Even in heavily exposed manufacturing workers, studies have not consistently found any adverse health effects directly attributable to PFC exposure. However, as research in this area is still ongoing, a cautious approach is recommended and exposure should be minimized.

Details on PFOS and PFOA are provided in the fact sheet available on the Queensland Health website. Further information will be shared as it becomes available.

Please contact the Darling Downs Health Public Health Unit on 46998240 if you require additional health advice related to this issue.

# Perfluorinated chemicals

## Oakey Army Aviation Centre contamination incident

### What are perfluorinated chemicals?

Perfluorooctanesulfonic acid (PFOS) and the related chemicals perfluorooctanoic acid (PFOA) and perfluorohexanesulfonic acid (PFHxS) are types of perfluorinated chemicals (PFCs). They can be found in everyday products such as all-weather clothing, water and stain repelling agents and non-stick cookware. These chemicals are also used in aqueous film forming foams (AFFFs), used by the Department of Defence and others, for training and operational firefighting purposes.

Between 1970 and 2005 the Department of Defence used fire-fighting foam containing PFCs at the Oakey Army Aviation Centre on the Darling Downs. PFCs are present on the site, and over the past decades have slowly worked their way through the soil to the groundwater underneath the site and contaminated land close to the site. The Department of Defence is undertaking environmental monitoring to determine the extent of the contamination.

### Why are these chemicals being phased out?

The manufacture and use of some PFCs are being discontinued or limited through international agreements and voluntary actions by manufacturers primarily because of their persistence in the environment, rather than because of any established health effects. PFCs break down very slowly in the environment under naturally occurring conditions. Because of this, they tend to accumulate in the food chain and in human tissue. The international scientific community has identified this characteristic as undesirable because of the potential for unforeseen effects resulting from accumulating levels, and the difficulty in removing these chemicals from the environment once they are released.

### How are people exposed to PFCs?

PFCs are found at very low levels in the blood of the general population all over the world. The sources of exposure in the general population are not fully understood, but it is known that exposure to trace levels can occur through the air, indoor dust, food, water and various consumer products such as non-stick cookware, paints and cleaning products. In Oakey, some members of the community may have higher levels of PFCs than the general Australian community, indicating that there has been additional exposure to PFCs. As PFCs have been detected in the ground water at Oakey, it is most likely that this is the source.

### Are there any health effects linked to PFCs in humans?

The potential effects of exposure to PFCs to human health continue to be studied. These studies involve occupationally exposed workers (i.e. manufacturing workers), residents in communities with higher exposure and studies of the general population in the USA and other countries.

Some studies have shown changes in serum lipids and other biochemical indicators that appear to be related to blood levels of PFOS, PFOA and other PFCs. There are no acute (immediate) health effects reported to be associated with exposure at levels observed at Oakey. There is also no conclusive evidence at this stage which links exposure to these chemicals with long term adverse health effects in humans, such

as cancer. Even in heavily exposed manufacturing workers (up to 1,000 times higher than the general population), studies have not consistently found any adverse health effects directly attributable to this exposure. However, as research in this area is still in its early stages, a cautious approach is best and so exposure should be minimized.

## Should I be concerned about the results of the animal studies describing exposure to PFCs?

Studies of chemical effects in animals are conducted at very high doses in order to give scientists an idea of what effects might occur and to provide a basis for estimating safe human exposure levels. For example, adverse effects are observed in animal studies of PFOA at exposures that lead to blood levels 1,000 to 10,000 times higher than the levels observed in people in the general population. While such studies help scientists to identify toxic responses to a chemical, this information cannot be directly related to humans who are exposed at much lower concentrations. While everyone in the population is likely to have been exposed to PFCs, the level of these exposures is substantially less than the exposures used in animal studies. Also, animals clear these chemicals from their bodies in different ways from humans, so results from animal testing cannot be directly applied to humans.

## What can I do to reduce my exposure?

If you live in the area with potentially affected groundwater, as indicated on the accompanying map provided by Department of Defence, you should not drink or prepare food with bore water from this area. While the exposure is likely to be low, you may also consider avoiding consumption of eggs or drinking milk from animals raised on your own property and avoiding consumption of fish caught from Oakey Creek, downstream from the Army Aviation Centre.

Ongoing investigations by the Department of Defence are expected to provide further information on the likelihood of exposure to PFCs from sources other than groundwater.

It is safe to drink water from the reticulated water supply (town water), and to consume commercial produce from the Oakey area.

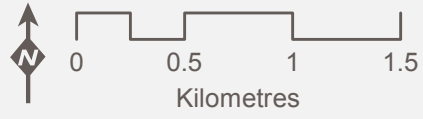
## Should I get my blood tested?

Department of Defence has arranged for a limited number of people to have their blood tested for PFCs. The Department of Health does not recommend blood testing because this does not predict the level of health risk.

Concerned community members should first contact the Department of Defence Community Hotline Number 1800 136 129. For more information about the monitoring program at Oakey, email [defence.oakey.anz@aecom.com](mailto:defence.oakey.anz@aecom.com). Anyone concerned about their own health or that of family members should talk to their GP or call 13HEALTH (13 43 25 84).



**AACO PFOS DETECTION AREA AND INVESTIGATION AREA**



1 cm = 350 metres

Datum: GDA 1994, Projection: MGA Zone 56

**LEGEND**

**PFOS Concentrations (µg/L)**

- < LOR
- LOR - 0.2
- 0.2-9.99
- 10-49
- 50-500
- Drainage

**Estimated PFOS Concentration Ranges (µg/L)**

- Limit of Reporting – 0.2
- 0.2 – 9.99
- 10 – 49
- 50 – 500

Investigation Area

Oakey Creek Groundwater Management Area

AACO Base Boundary

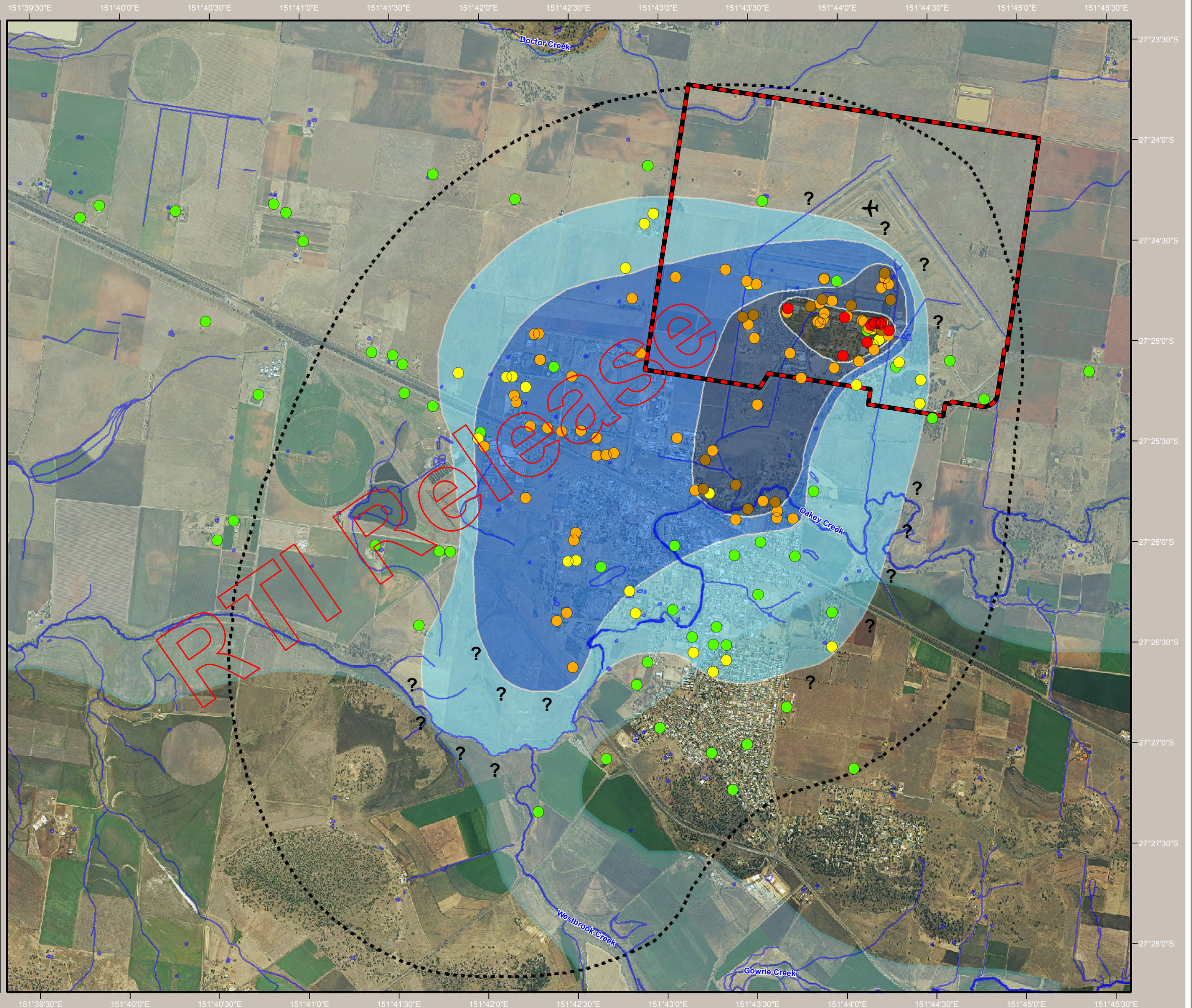
Indicates that limited data has  
? been able to be collected in this area

**Disclaimers**

PFOS concentration ranges displayed on this figure are based on the highest PFOS detection reported for any given location (i.e. from one or more sampling events), which includes data from Parsons Brinckerhoff (2012-2013) and AECOM (2013-2015) groundwater investigations.

LOR = Laboratory Limit of Reporting Note: This figure has been compiled to provide a visual representation of PFOS concentrations in sampled bores, and does not represent the full nature and extent of bore water impacts in the area, nor does it represent inferred aquifer conditions.

Bore water has been sampled directly from the bores represented on this figure at the point of extraction (i.e. at the ground surface or as close to the extraction point as possible). Details of bore construction is not available for all bores sampled, however those bore where construction information is available are not all screened within the same portion of the aquifer (i.e. the water sampled is not all from the same depth below ground) and caution should be taken in extrapolating PFOS concentrations between data points. The shading provided on this figure represents the area over which PFOS has been detected at various concentration intervals (refer to legend above). This figure is not intended to be used for the purpose of understanding the full extent of bore water and/or aquifer impacts, but provides an indication of potential exposure point concentrations. Caution should be used when using this figure for any other than for preliminary indicative purposes.



Last Update: August 2015



**AACO PFOA DETECTION AREA AND INVESTIGATION AREA**



1 cm = 350 metres

Datum: GDA 1994, Projection: MGA Zone 56

**LEGEND**

**PFOA Concentrations (µg/L)**

- < LOR
- LOR - 0.4
- 0.4 - 9.99
- 10 - 49
- 50 - 500
- Drainage

**Estimated PFOA Concentration Ranges (µg/L)**

- Limit of Reporting – 0.4
- 0.4 – 9.99
- 10 – 49
- 50 - 500

- Investigation Area
- Oakey Creek Groundwater Management Area

- AACO Base Boundary

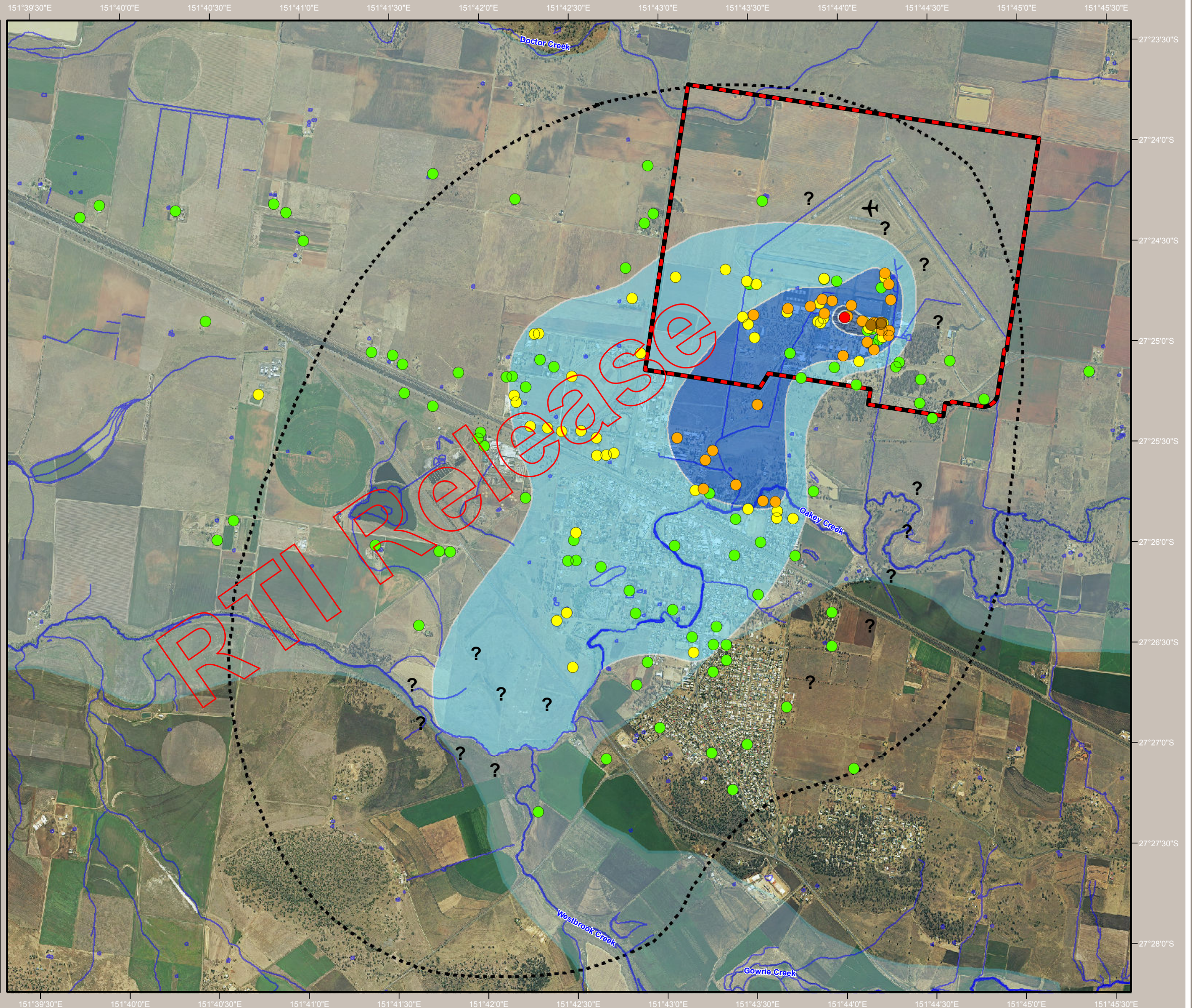
Indicates that limited data has  
? been able to be collected in this area

**Disclaimers**

PFOA concentration ranges displayed on this figure are based on the highest PFOA detection reported for any given location (i.e. from one or more sampling events), which includes data from Parsons Brinckerhoff (2012-2013) and AECOM (2013-2015) groundwater investigations.

LOR = Laboratory Limit of Reporting Note: This figure has been compiled to provide a visual representation of PFOA concentrations in sampled bores, and does not represent the full nature and extent of bore water impacts in the area, nor does it represent inferred aquifer conditions.

Bore water has been sampled directly from the bores represented on this figure at the point of extraction (i.e. at the ground surface or as close to the extraction point as possible). Details of bore construction is not available for all bores sampled, however those bore where construction information is available are not all screened within the same portion of the aquifer (i.e. the water sampled is not all from the same depth below ground) and caution should be taken in extrapolating PFOA concentrations between data points. The shading provided on this figure represents the area over which PFOA has been detected at various concentration intervals (refer to legend above). This figure is not intended to be used for the purpose of understanding the full extent of bore water and/or aquifer impacts, but provides an indication of potential exposure point concentrations. Caution should be used when using this figure for any other than for preliminary indicative purposes.



Last Update: August 2015





# Army Aviation Centre Oakey Environmental Investigation

## About the Investigation

The Department of Defence (Defence) is undertaking a long-term environmental investigation and assessment of the groundwater beneath the Army Aviation Centre Oakey (AACO) base and surrounds. It is anticipated the investigation and any subsequent management actions may take several years to implement.

The purpose of the investigation is to understand impacts to the environment from the historical use of fire-fighting foams, at the AACO as part of training activities. These foams contained perfluorooctane sulphonate (PFOS) and perfluorooctanoic acid (PFOA), which are two of the many types of per- and polyfluorinated chemicals (PFCs).

The information collected will assist Defence to understand the groundwater impacts and contribute to developing appropriate strategies for managing any potential human health and ecological risks.

## Next Stages – Assessments and Field Work

From mid-2015 to mid-2016, the investigation will involve a hydrogeological assessment and a human health and ecological risk assessment.

### Hydrogeological Assessment

Defence has commenced a hydrogeological investigation to further understand the nature and extent of the groundwater impacts. This involves:

- periodic sampling and testing of ground and surface water
- targeted soil sampling
- installing groundwater monitoring wells at key locations
- hydrogeological modelling.

To assist with ongoing monitoring of the groundwater impacts, Defence will install a number of new monitoring wells at the AACO base and surrounding area.

Outside the base, 10 wells will be installed at five locations within the Investigation Area. These wells will all be installed on Government-owned land, mainly along roadside easements.

Drilling rigs will be used to install the monitoring wells, which will remain in place for several years. These works are anticipated to occur in mid-to-late 2015.

## Human Health and Ecological Risk Assessment

To inform the human health and ecological risk assessment, selected flora and fauna will be tested. This includes testing animals and crops that are part of the human food chain, as well as some that are not. This testing will be undertaken based on the technical requirements of the investigation. It will not be necessary to collect samples from all plant and animal species within the Investigation Area.

Plant and animal testing will not be undertaken by-request. Defence will make direct contact with landholders who may be able to assist the investigation with testing.



Example of a drilling rig.

## Using Bore Water for Drinking

As a precaution, it is recommended that residents not drink water sourced from underground water bores within the Investigation Area, until further notice. This includes boiled bore water.

Landholders and residents within the Investigation Area, who use bore water for drinking water or household use, should contact Defence to discuss possible management strategies.

Each household's drinking water requirements will be assessed on a case-by-case basis to select the most appropriate alternative water sources available.







### Current Investigation and Detection Areas

The 'Detection Area' shows the area where groundwater with concentrations of PFOS has been detected at Oakey. This is based on bore water sample results and may change as more samples are tested.

The 'Investigation Area' is the broader area beyond the Detection Area which is being studied as part of assessing the extent of the contaminated groundwater. It may change with time as more information becomes available. A map showing the PFOA Investigation and Detection Areas is available on the project website.

### Drinking Water Screening Levels

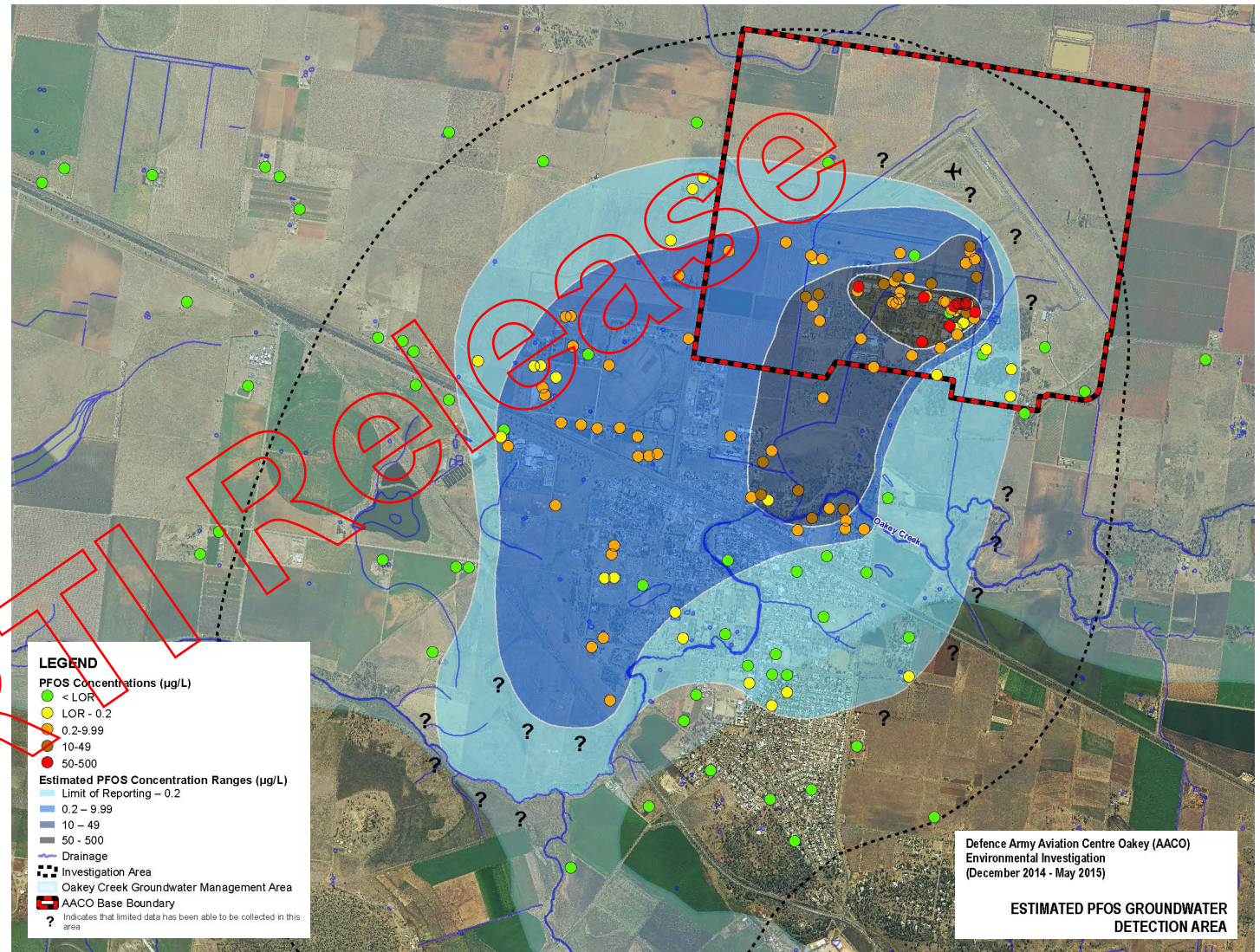
Australia currently has no guidelines for assessing PFOS and PFOA concentrations in drinking water. Defence is using Provisional Health Advisory (PHA) values developed in 2009 by the Office of Water, a division of the US Environmental Protection Agency (EPA).

The PHA value for PFOS is 0.2 µg/L (micrograms per litre). The PHA value for PFOA is 0.4 µg/L. If concentrations exceed these screening levels, action should be taken to reduce exposure to PFOS and PFOA in drinking water.

### Contact

- 1800 136 129 freecall (business hours)
- [www.defence.gov.au/id/oakey](http://www.defence.gov.au/id/oakey)
- [defence.oakey.anz@aecom.com](mailto:defence.oakey.anz@aecom.com)
- Army Aviation Centre Oakey (AACO)  
Environmental Investigation Project  
C/AECOM Pty Ltd  
PO Box 1307, Fortitude Valley Qld 4006

Media enquiries should be directed to Defence Media Operations on [02] 6127 1999 or [mediaops@defence.gov.au](mailto:mediaops@defence.gov.au)





## Serum Perfluorooctane sulfonic acid (PFOS) (1999 – 2010)

Geometric mean and selected percentiles of serum concentrations (in µg/L) for the U.S. population from the National Health and Nutrition Examination Survey.

	Survey years	Geometric mean	Selected percentiles				Sample size
		(95% conf. interval)	(95% confidence interval)				
			50th	75th	90th	95th	
Total	99-00	<b>30.4</b> (27.1-33.9)	<b>30.2</b> (27.8-33.9)	<b>43.7</b> (37.5-47.3)	<b>57.0</b> (50.2-71.7)	<b>75.7</b> (58.1-97.5)	1562
	03-04	<b>20.7</b> (19.2-22.3)	<b>21.2</b> (19.8-22.4)	<b>30.0</b> (27.5-33.0)	<b>41.3</b> (35.6-50.0)	<b>54.6</b> (44.0-66.5)	2094
	05-06	<b>17.1</b> (16.0-18.2)	<b>17.5</b> (16.8-18.6)	<b>27.2</b> (24.9-29.6)	<b>39.4</b> (34.9-43.1)	<b>47.5</b> (42.7-56.8)	2120
	07-08	<b>13.2</b> (12.2-14.2)	<b>13.6</b> (12.8-14.7)	<b>21.0</b> (18.9-23.3)	<b>32.6</b> (29.4-36.3)	<b>40.5</b> (35.4-47.4)	2100
	09-10	<b>9.32</b> (8.13-10.7)	<b>9.70</b> (8.50-10.8)	<b>14.8</b> (12.9-17.3)	<b>23.7</b> (18.3-30.2)	<b>32.0</b> (22.6-48.5)	2233
<b>Age group</b>							
12-19 years	99-00	<b>29.1</b> (26.2-32.4)	<b>29.5</b> (26.9-34.2)	<b>39.0</b> (35.9-45.0)	<b>52.7</b> (46.0-56.2)	<b>57.4</b> (52.7-66.5)	543
	03-04	<b>19.3</b> (17.5-21.4)	<b>19.9</b> (17.8-22.0)	<b>27.1</b> (23.7-30.2)	<b>36.5</b> (28.6-45.6)	<b>42.6</b> (35.1-52.1)	640
	05-06	<b>15.0</b> (14.3-15.7)	<b>14.9</b> (13.6-16.6)	<b>22.7</b> (19.7-24.9)	<b>30.6</b> (27.8-34.1)	<b>38.5</b> (33.0-44.6)	640
	07-08	<b>11.3</b> (10.3-12.3)	<b>11.3</b> (10.3-13.0)	<b>15.9</b> (15.1-17.7)	<b>21.7</b> (17.7-28.2)	<b>28.0</b> (22.0-32.2)	357
	09-10	<b>6.84</b> (5.81-8.06)	<b>6.90</b> (6.00-8.40)	<b>10.7</b> (8.90-12.5)	<b>14.4</b> (12.4-16.1)	<b>18.1</b> (13.5-26.0)	364
20 years and older	99-00	<b>30.6</b> (27.1-34.4)	<b>30.3</b> (27.9-33.9)	<b>44.4</b> (37.9-48.0)	<b>58.0</b> (50.1-75.7)	<b>78.0</b> (59.9-107)	1019
	03-04	<b>20.9</b> (19.3-22.5)	<b>21.4</b> (19.8-22.8)	<b>30.4</b> (28.1-33.0)	<b>42.7</b> (35.7-53.3)	<b>57.8</b> (45.7-69.4)	1454
	05-06	<b>17.4</b> (16.2-18.7)	<b>18.0</b> (17.1-19.4)	<b>27.8</b> (25.3-30.8)	<b>40.2</b> (35.6-44.5)	<b>49.6</b> (42.8-60.7)	1480
	07-08	<b>13.5</b> (12.4-14.6)	<b>14.0</b> (13.0-15.5)	<b>21.7</b> (19.5-24.6)	<b>33.9</b> (29.9-39.0)	<b>42.8</b> (37.3-50.3)	1743
	09-10	<b>9.72</b> (8.45-11.2)	<b>10.1</b> (8.90-11.2)	<b>15.7</b> (13.4-18.4)	<b>25.3</b> (19.3-32.9)	<b>34.1</b> (23.4-52.7)	1869
<b>Gender</b>							
Males	99-00	<b>33.4</b> (29.6-37.6)	<b>34.9</b> (31.1-37.9)	<b>46.3</b> (41.2-51.6)	<b>58.4</b> (50.2-78.3)	<b>78.3</b> (58.0-108)	743
	03-04	<b>23.2</b> (21.1-25.6)	<b>23.9</b> (22.4-25.5)	<b>32.2</b> (28.8-35.9)	<b>45.3</b> (35.5-62.7)	<b>62.7</b> (43.8-81.8)	1053
	05-06	<b>20.5</b> (19.4-21.8)	<b>21.3</b> (20.0-22.5)	<b>31.4</b> (27.9-33.7)	<b>43.3</b> (38.7-49.7)	<b>54.3</b> (43.5-80.7)	1048
	07-08	<b>16.3</b> (15.0-17.7)	<b>17.0</b> (15.7-17.8)	<b>23.9</b> (21.6-26.9)	<b>36.4</b> (33.5-41.1)	<b>45.3</b> (40.4-53.1)	1059
	09-10	<b>11.5</b> (9.93-13.3)	<b>11.8</b> (10.6-12.9)	<b>16.8</b> (14.7-20.4)	<b>25.7</b> (19.4-39.7)	<b>37.4</b> (22.5-72.3)	1075
Females	99-00	<b>28.0</b> (24.6-31.8)	<b>27.8</b> (24.5-30.2)	<b>39.0</b> (32.7-46.0)	<b>55.4</b> (46.3-70.2)	<b>75.7</b> (56.1-98.4)	819
	03-04	<b>18.4</b> (17.0-20.0)	<b>18.2</b> (16.9-19.8)	<b>27.4</b> (23.8-30.2)	<b>39.8</b> (34.4-42.6)	<b>46.6</b> (42.3-61.5)	1041
	05-06	<b>14.4</b> (13.3-15.4)	<b>14.6</b> (13.5-15.9)	<b>23.3</b> (21.1-25.3)	<b>34.2</b> (30.6-37.7)	<b>42.8</b> (38.0-46.5)	1072
	07-08	<b>10.7</b> (9.70-11.7)	<b>10.7</b> (9.80-11.7)	<b>17.2</b> (15.4-19.1)	<b>28.7</b> (21.7-32.5)	<b>33.6</b> (29.9-41.6)	1041
	09-10	<b>7.65</b> (6.73-8.71)	<b>7.80</b> (6.70-9.00)	<b>12.0</b> (10.8-14.4)	<b>21.1</b> (16.4-26.9)	<b>28.8</b> (22.3-34.1)	1158

Limit of detection (LOD, see Data Analysis section) for Survey years 99-00, 03-04, 05-06, 07-08, and 09-10 are 0.2, 0.4, 0.2, 0.2, and 0.2 respectively.

Biomonitoring Summary: [http://www.cdc.gov/biomonitoring/PFCs\\_BiomonitoringSummary.html](http://www.cdc.gov/biomonitoring/PFCs_BiomonitoringSummary.html)

Factsheet: [http://www.cdc.gov/biomonitoring/PFCs\\_FactSheet.html](http://www.cdc.gov/biomonitoring/PFCs_FactSheet.html)



## Serum Perfluorooctanoic acid (PFOA) (1999 – 2010)

Geometric mean and selected percentiles of serum concentrations (in µg/L) for the U.S. population from the National Health and Nutrition Examination Survey.

	Survey years	Geometric mean	Selected percentiles				Sample size
		(95% conf. interval)	(95% confidence interval)				
			50th	75th	90th	95th	
Total	99-00	<b>5.21</b> (4.72-5.74)	<b>5.20</b> (4.80-5.90)	<b>6.90</b> (6.30-7.80)	<b>9.40</b> (8.20-11.1)	<b>11.9</b> (10.9-13.5)	1562
	03-04	<b>3.95</b> (3.65-4.27)	<b>4.10</b> (3.80-4.40)	<b>5.80</b> (5.30-6.40)	<b>7.80</b> (6.70-9.60)	<b>9.80</b> (7.40-14.1)	2094
	05-06	<b>3.92</b> (3.48-4.42)	<b>4.20</b> (3.80-4.50)	<b>6.20</b> (5.40-7.20)	<b>9.00</b> (7.40-11.2)	<b>11.3</b> (8.80-14.5)	2120
	07-08	<b>4.12</b> (4.01-4.24)	<b>4.30</b> (4.20-4.50)	<b>5.90</b> (5.70-6.20)	<b>7.90</b> (7.50-8.30)	<b>9.60</b> (8.90-10.1)	2100
	09-10	<b>3.07</b> (2.81-3.36)	<b>3.20</b> (2.90-3.50)	<b>4.60</b> (4.10-5.10)	<b>6.00</b> (5.30-7.20)	<b>7.50</b> (6.20-9.70)	2233
<b>Age group</b>							
12-19 years	99-00	<b>5.46</b> (4.98-5.99)	<b>5.60</b> (4.90-6.10)	<b>6.90</b> (6.20-7.70)	<b>9.40</b> (7.70-11.0)	<b>11.6</b> (10.2-12.5)	543
	03-04	<b>3.89</b> (3.47-4.35)	<b>4.00</b> (3.50-4.50)	<b>5.40</b> (4.60-6.10)	<b>7.00</b> (5.60-9.20)	<b>8.60</b> (5.90-12.6)	640
	05-06	<b>3.59</b> (3.26-3.96)	<b>3.80</b> (3.30-4.20)	<b>5.40</b> (4.60-5.90)	<b>6.90</b> (6.30-7.90)	<b>8.40</b> (7.30-10.1)	640
	07-08	<b>3.91</b> (3.71-4.12)	<b>4.00</b> (3.70-4.40)	<b>5.00</b> (4.70-5.50)	<b>6.10</b> (5.70-6.70)	<b>7.30</b> (6.20-8.00)	357
	09-10	<b>2.74</b> (2.46-3.05)	<b>2.90</b> (2.60-3.10)	<b>3.80</b> (3.30-4.20)	<b>4.80</b> (4.10-5.80)	<b>5.00</b> (4.40-7.20)	364
20 years and older	99-00	<b>5.16</b> (4.66-5.72)	<b>5.20</b> (4.70-5.70)	<b>7.00</b> (6.30-7.80)	<b>9.40</b> (8.20-11.1)	<b>12.0</b> (10.8-14.0)	1019
	03-04	<b>3.96</b> (3.67-4.27)	<b>4.10</b> (3.90-4.40)	<b>5.90</b> (5.40-6.50)	<b>7.80</b> (6.80-9.60)	<b>9.90</b> (7.60-14.2)	1454
	05-06	<b>3.97</b> (3.51-4.49)	<b>4.20</b> (3.80-4.60)	<b>6.40</b> (5.40-7.50)	<b>9.30</b> (7.40-11.9)	<b>11.6</b> (9.00-14.8)	1480
	07-08	<b>4.15</b> (4.02-4.30)	<b>4.30</b> (4.20-4.60)	<b>6.10</b> (5.80-6.50)	<b>8.10</b> (7.70-8.70)	<b>9.80</b> (9.00-10.4)	1743
	09-10	<b>3.12</b> (2.84-3.43)	<b>3.30</b> (3.00-3.60)	<b>4.70</b> (4.20-5.30)	<b>6.40</b> (5.40-7.50)	<b>7.70</b> (6.30-10.2)	1869
<b>Gender</b>							
Males	99-00	<b>5.71</b> (5.17-6.31)	<b>6.00</b> (5.40-6.50)	<b>7.70</b> (6.80-8.70)	<b>10.6</b> (9.00-11.8)	<b>12.1</b> (11.2-13.1)	743
	03-04	<b>4.47</b> (4.07-4.91)	<b>4.60</b> (4.30-5.00)	<b>6.30</b> (5.70-7.20)	<b>8.40</b> (6.80-12.5)	<b>10.7</b> (7.40-17.5)	1053
	05-06	<b>4.69</b> (4.23-5.20)	<b>4.90</b> (4.40-5.40)	<b>7.20</b> (6.10-8.00)	<b>9.90</b> (8.00-12.2)	<b>12.2</b> (9.60-15.2)	1048
	07-08	<b>4.80</b> (4.55-5.06)	<b>4.90</b> (4.60-5.20)	<b>6.70</b> (6.30-7.10)	<b>8.70</b> (8.10-9.30)	<b>10.1</b> (9.50-11.1)	1059
	09-10	<b>3.53</b> (3.22-3.87)	<b>3.70</b> (3.40-4.00)	<b>4.90</b> (4.50-5.40)	<b>6.80</b> (5.40-8.00)	<b>7.90</b> (6.40-10.2)	1075
Females	99-00	<b>4.80</b> (4.32-5.34)	<b>4.70</b> (4.40-5.20)	<b>6.30</b> (5.60-7.10)	<b>8.30</b> (7.50-9.90)	<b>11.3</b> (9.20-14.4)	819
	03-04	<b>3.50</b> (3.21-3.82)	<b>3.60</b> (3.30-3.90)	<b>5.20</b> (4.70-5.80)	<b>7.10</b> (6.30-8.20)	<b>8.60</b> (7.40-10.6)	1041
	05-06	<b>3.31</b> (2.89-3.79)	<b>3.50</b> (3.10-4.00)	<b>5.20</b> (4.40-6.00)	<b>7.90</b> (6.10-9.70)	<b>10.1</b> (7.50-14.2)	1072
	07-08	<b>3.55</b> (3.38-3.73)	<b>3.70</b> (3.50-3.90)	<b>5.20</b> (4.80-5.60)	<b>7.00</b> (6.50-7.50)	<b>8.30</b> (7.20-9.90)	1041
	09-10	<b>2.69</b> (2.45-2.96)	<b>2.70</b> (2.50-3.00)	<b>4.10</b> (3.60-4.70)	<b>5.60</b> (5.10-6.50)	<b>6.90</b> (5.80-8.40)	1158

Limit of detection (LOD, see Data Analysis section) for Survey years 99-00, 03-04, 05-06, 07-08, and 09-10 are 0.1, 0.2, 0.1, 0.1, and 0.1 respectively.

Biomonitoring Summary: [http://www.cdc.gov/biomonitoring/PFCs\\_BiomonitoringSummary.html](http://www.cdc.gov/biomonitoring/PFCs_BiomonitoringSummary.html)

Factsheet: [http://www.cdc.gov/biomonitoring/PFCs\\_FactSheet.html](http://www.cdc.gov/biomonitoring/PFCs_FactSheet.html)



## Serum Perfluorohexane sulfonic acid (PFHxS) (1999 – 2010)

Geometric mean and selected percentiles of serum concentrations (in µg/L) for the U.S. population from the National Health and Nutrition Examination Survey.

	Survey years	Geometric mean	Selected percentiles				Sample size
		(95% conf. interval)	(95% confidence interval)				
			50th	75th	90th	95th	
Total	99-00	<b>2.13</b> (1.91-2.38)	<b>2.10</b> (1.80-2.30)	<b>3.40</b> (3.10-4.00)	<b>5.80</b> (5.20-6.90)	<b>8.70</b> (7.00-10.0)	1562
	03-04	<b>1.93</b> (1.73-2.16)	<b>1.90</b> (1.70-2.10)	<b>3.30</b> (2.80-3.90)	<b>5.90</b> (4.80-7.20)	<b>8.30</b> (7.10-9.70)	2094
	05-06	<b>1.67</b> (1.42-1.98)	<b>1.80</b> (1.50-2.10)	<b>3.20</b> (2.60-4.00)	<b>5.40</b> (4.40-7.10)	<b>8.30</b> (5.80-11.9)	2120
	07-08	<b>1.95</b> (1.76-2.17)	<b>2.00</b> (1.80-2.10)	<b>3.50</b> (3.10-4.00)	<b>5.90</b> (4.90-8.30)	<b>9.80</b> (6.10-15.2)	2100
	09-10	<b>1.66</b> (1.51-1.82)	<b>1.70</b> (1.50-1.90)	<b>3.00</b> (2.60-3.30)	<b>4.80</b> (4.40-5.30)	<b>6.90</b> (5.90-7.60)	2233
<b>Age group</b>							
12-19 years	99-00	<b>2.69</b> (2.14-3.39)	<b>2.50</b> (2.00-3.70)	<b>5.00</b> (3.60-6.50)	<b>8.00</b> (5.80-12.9)	<b>12.9</b> (6.90-16.4)	543
	03-04	<b>2.44</b> (2.05-2.90)	<b>2.40</b> (1.80-3.20)	<b>4.90</b> (4.00-6.30)	<b>9.50</b> (6.80-12.5)	<b>13.3</b> (9.90-19.6)	640
	05-06	<b>2.09</b> (1.74-2.52)	<b>2.40</b> (2.00-2.90)	<b>4.30</b> (3.70-5.40)	<b>9.50</b> (6.40-13.4)	<b>14.1</b> (9.80-17.8)	640
	07-08	<b>2.40</b> (2.09-2.75)	<b>2.30</b> (1.80-2.70)	<b>4.30</b> (3.70-5.70)	<b>9.90</b> (6.50-12.5)	<b>15.9</b> (11.1-21.5)	357
	09-10	<b>2.03</b> (1.77-2.33)	<b>1.90</b> (1.60-2.10)	<b>3.80</b> (3.20-4.20)	<b>8.10</b> (6.30-9.70)	<b>12.3</b> (8.60-19.0)	364
20 years and older	99-00	<b>2.05</b> (1.85-2.27)	<b>2.00</b> (1.80-2.30)	<b>3.30</b> (3.00-3.70)	<b>5.40</b> (4.90-5.90)	<b>8.20</b> (6.70-9.50)	1019
	03-04	<b>1.86</b> (1.67-2.08)	<b>1.80</b> (1.60-2.10)	<b>3.00</b> (2.60-3.60)	<b>5.50</b> (4.50-6.70)	<b>7.60</b> (6.30-9.40)	1454
	05-06	<b>1.62</b> (1.37-1.92)	<b>1.70</b> (1.50-2.10)	<b>3.10</b> (2.50-3.80)	<b>5.20</b> (4.20-6.50)	<b>7.20</b> (5.10-11.6)	1480
	07-08	<b>1.90</b> (1.69-2.13)	<b>1.90</b> (1.70-2.10)	<b>3.30</b> (2.90-3.90)	<b>5.80</b> (4.50-8.00)	<b>9.00</b> (5.60-15.0)	1743
	09-10	<b>1.61</b> (1.45-1.79)	<b>1.70</b> (1.50-1.90)	<b>2.90</b> (2.50-3.30)	<b>4.50</b> (4.00-5.20)	<b>6.00</b> (5.40-7.10)	1869
<b>Gender</b>							
Males	99-00	<b>2.61</b> (2.27-3.00)	<b>2.60</b> (2.20-3.00)	<b>4.10</b> (3.50-4.70)	<b>6.60</b> (5.30-9.40)	<b>10.5</b> (6.90-15.0)	743
	03-04	<b>2.17</b> (1.87-2.51)	<b>2.10</b> (1.80-2.40)	<b>3.40</b> (2.80-4.50)	<b>6.10</b> (4.60-8.10)	<b>8.50</b> (6.50-10.5)	1053
	05-06	<b>2.08</b> (1.76-2.45)	<b>2.20</b> (1.80-2.70)	<b>3.70</b> (3.20-4.60)	<b>6.40</b> (4.80-9.30)	<b>9.50</b> (6.70-13.7)	1048
	07-08	<b>2.63</b> (2.36-2.94)	<b>2.60</b> (2.40-2.80)	<b>4.20</b> (3.80-4.90)	<b>7.30</b> (5.50-11.0)	<b>11.4</b> (7.10-18.1)	1059
	09-10	<b>2.21</b> (1.99-2.46)	<b>2.20</b> (1.90-2.50)	<b>3.40</b> (3.00-4.00)	<b>5.50</b> (5.00-6.40)	<b>7.80</b> (6.50-9.90)	1075
Females	99-00	<b>1.79</b> (1.56-2.06)	<b>1.70</b> (1.50-2.10)	<b>2.80</b> (2.30-3.50)	<b>5.10</b> (4.10-6.70)	<b>8.00</b> (5.70-9.00)	819
	03-04	<b>1.72</b> (1.56-1.91)	<b>1.60</b> (1.40-1.80)	<b>2.90</b> (2.50-3.50)	<b>5.80</b> (4.60-7.10)	<b>8.20</b> (6.70-10.0)	1041
	05-06	<b>1.37</b> (1.15-1.63)	<b>1.50</b> (1.20-1.70)	<b>2.80</b> (2.20-3.30)	<b>4.60</b> (3.90-5.80)	<b>6.60</b> (5.60-9.30)	1072
	07-08	<b>1.46</b> (1.30-1.64)	<b>1.40</b> (1.30-1.50)	<b>2.60</b> (2.20-3.10)	<b>4.70</b> (3.80-6.10)	<b>7.50</b> (5.00-12.5)	1041
	09-10	<b>1.26</b> (1.14-1.40)	<b>1.30</b> (1.20-1.40)	<b>2.20</b> (2.00-2.60)	<b>4.00</b> (3.50-4.50)	<b>5.40</b> (4.70-6.50)	1158

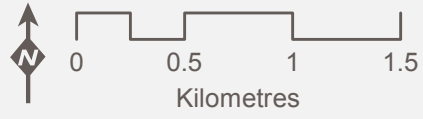
Limit of detection (LOD, see Data Analysis section) for Survey years 99-00, 03-04, 05-06, 07-08, and 09-10 are 0.1, 0.3, 0.1, 0.1, and 0.1 respectively.

Biomonitoring Summary: [http://www.cdc.gov/biomonitoring/PFCs\\_BiomonitoringSummary.html](http://www.cdc.gov/biomonitoring/PFCs_BiomonitoringSummary.html)

Factsheet: [http://www.cdc.gov/biomonitoring/PFCs\\_FactSheet.html](http://www.cdc.gov/biomonitoring/PFCs_FactSheet.html)



**AACO PFOS DETECTION AREA AND INVESTIGATION AREA**



1 cm = 350 metres

Datum: GDA 1994, Projection: MGA Zone 56

**LEGEND**

**PFOS Concentrations (µg/L)**

- < LOR
- LOR - 0.2
- 0.2-9.99
- 10-49
- 50-500
- Drainage

**Estimated PFOS Concentration Ranges (µg/L)**

- Limit of Reporting – 0.2
- 0.2 – 9.99
- 10 – 49
- 50 - 500

Investigation Area

Oakey Creek Groundwater Management Area

AACO Base Boundary

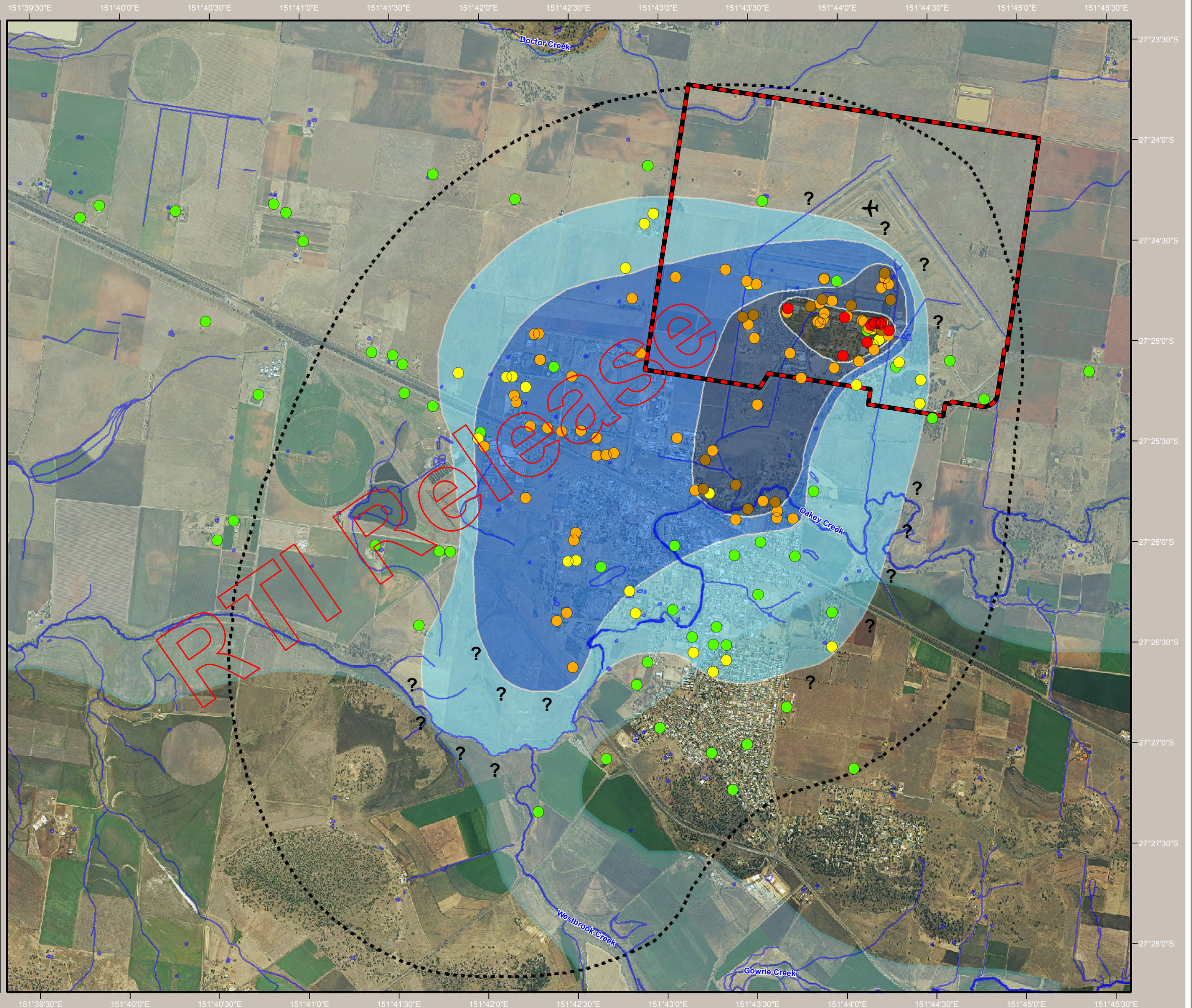
Indicates that limited data has  
? been able to be collected in this area

**Disclaimers**

PFOS concentration ranges displayed on this figure are based on the highest PFOS detection reported for any given location (i.e. from one or more sampling events), which includes data from Parsons Brinckerhoff (2012-2013) and AECOM (2013-2015) groundwater investigations.

LOR = Laboratory Limit of Reporting Note: This figure has been compiled to provide a visual representation of PFOS concentrations in sampled bores, and does not represent the full nature and extent of bore water impacts in the area, nor does it represent inferred aquifer conditions.

Bore water has been sampled directly from the bores represented on this figure at the point of extraction (i.e. at the ground surface or as close to the extraction point as possible). Details of bore construction is not available for all bores sampled, however those bore where construction information is available are not all screened within the same portion of the aquifer (i.e. the water sampled is not all from the same depth below ground) and caution should be taken in extrapolating PFOS concentrations between data points. The shading provided on this figure represents the area over which PFOS has been detected at various concentration intervals (refer to legend above). This figure is not intended to be used for the purpose of understanding the full extent of bore water and/or aquifer impacts, but provides an indication of potential exposure point concentrations. Caution should be used when using this figure for any other than for preliminary indicative purposes.



Last Update: August 2015



**AACO PFOA DETECTION AREA AND INVESTIGATION AREA**



1 cm = 350 metres

Datum: GDA 1994, Projection: MGA Zone 56

**LEGEND**

**PFOA Concentrations (µg/L)**

- < LOR
- LOR - 0.4
- 0.4 - 9.99
- 10 - 49
- 50 - 500
- Drainage

**Estimated PFOA Concentration Ranges (µg/L)**

- Limit of Reporting – 0.4
- 0.4 – 9.99
- 10 – 49
- 50 - 500

- Investigation Area
- Oakey Creek Groundwater Management Area
- AACO Base Boundary

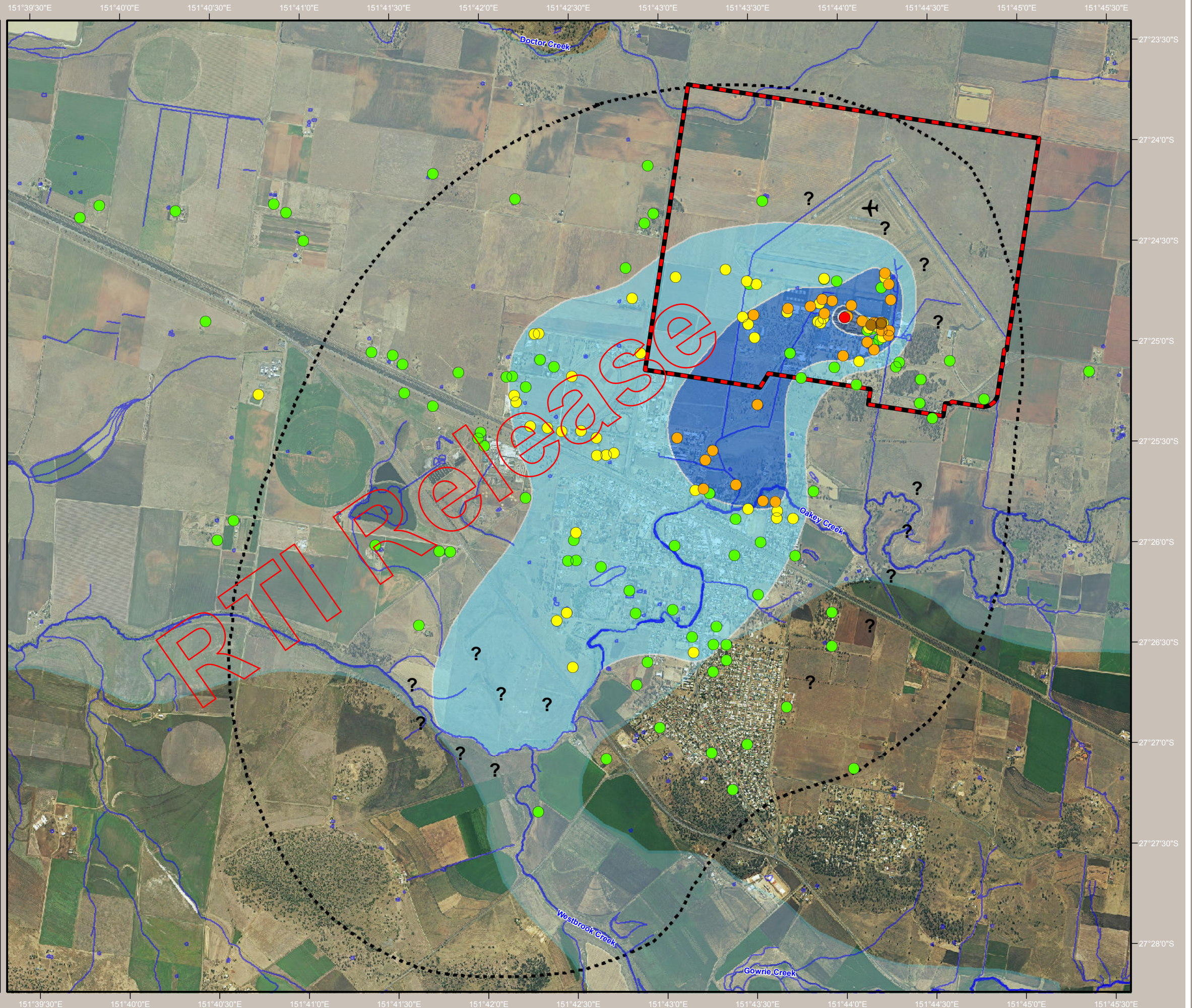
Indicates that limited data has  
? been able to be collected in this  
area

**Disclaimers**

PFOA concentration ranges displayed on this figure are based on the highest PFOA detection reported for any given location (i.e. from one or more sampling events), which includes data from Parsons Brinckerhoff (2012-2013) and AECOM (2013-2015) groundwater investigations.

LOR = Laboratory Limit of Reporting Note: This figure has been compiled to provide a visual representation of PFOA concentrations in sampled bores, and does not represent the full nature and extent of bore water impacts in the area, nor does it represent inferred aquifer conditions.

Bore water has been sampled directly from the bores represented on this figure at the point of extraction (i.e. at the ground surface or as close to the extraction point as possible). Details of bore construction is not available for all bores sampled, however those bore where construction information is available are not all screened within the same portion of the aquifer (i.e. the water sampled is not all from the same depth below ground) and caution should be taken in extrapolating PFOA concentrations between data points. The shading provided on this figure represents the area over which PFOA has been detected at various concentration intervals (refer to legend above). This figure is not intended to be used for the purpose of understanding the full extent of bore water and/or aquifer impacts, but provides an indication of potential exposure point concentrations. Caution should be used when using this figure for any other than for preliminary indicative purposes.



Last Update: August 2015