

Dear [REDACTED]

Please see responses to your queries in blue text below.

Kind regards

[REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

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[REDACTED]
Sent: 03 December 2025 17:09

To: [REDACTED]
[REDACTED]

Subject: Angus Fire Limited, EPR/XP3832NV/V004 - RFI on development of PFAS removal technology

Hello [REDACTED]

I hope you received the draft Environment Agency guidance I sent you earlier.

Based on the new PFAS thresholds proposed in that report, and innovations in PFAS removal technologies (such as those highlighted in today's conference on "Effectively Assessing & Managing PFAS 2025"), I require some further justification of the methodologies adopted by Angus Fire Limited to treat PFAS in stormwater.

Can you please supply the following additional information?

1. At my site visit to Angus Fire Limited on 29/07/2025, I was shown results of trials and commissioning to optimise the use of SAFF/PAC. These results showed increasing levels of PFAS reduction as the treatment train was optimised.

Please submit the results of these trials and commissioning.

Please outline the specific changes to operation, equipment and abatement media (foaming agent and activated carbon) that were made during these trials/commissioning works.

- **Please confirm if different grades or different sizes of powdered and granular activated carbon were used in these trials/commissioning.**

Initially the plant was run up in a standard (as supplied) configuration and observations were made. It was seen that the foam only started generation at stage 6 and at the end of stage 10 it was still a relatively wet and unstable foam which indicates potentially incomplete fractionation. From this point incremental amendments were made, foam generation observed and samples taken for laboratory assessment. The primary programme amendment is to change the pump frequency (in Hertz) to change the size and intensity of the fractionation column within the primary processing tanks. 12 amendments were tested to establish the optimum pump frequency, cycle time and inclusion of foaming additive. This included a focus on removing some of the longer chains early in the cycle to allow the process to focus on removal of the more challenging PFAS at later stages, achieved through a two-stage addition of foaming additive.

Through this process, PAC dosing was reviewed but was stabilised at 0.5kg/m³ after the data demonstrated that this approach was consistently effective. No change to Carbon material has been tested at this stage, however we have the potential for future trials once processing is re-established to test PAC materials with different size carbon particles as some of these may offer opportunities to further improve removal rates for shorter chain molecules.

As stated previously, Angus is committed to further optimisation of the process to target a wide range of PFAS species but is currently limited by the volume of retained stormwater being stored on site.

Analytical data following the trials to optimise the process were provided in the report provided in response to the Schedule 5 Notification issued by the EA on 2nd September 2025. The response provided data on six samples for pre and post treatment. The table is presented below for completeness.

Data Summary From Angus Fire SAFF/PAC Treatment Train Commissioning
Data covers 6 Influent samples and 6 Effluent Samples

Commissioning Stage Reference	Date	Outline description of scope	Influent Source	Influent PFOS (ug/l) LOD of 0.05ug/l Lab Standard level.	Influent Non-PFOS PFAS Total Targetted Species (ug/l) Various LOD, at Standard Lab LOD. 6:2FTAB (Capstone B), 6:2FTS, PFHxA, 8:2 FTS, PFPeA, PFHpA, PFBA, PFOA, PFHxS, FHSxA, PFNA, PFDA	Total Influent Concentrations (All recorded PFAS) (ug/l)	Post PAC PFOS (ug/l) LOD of 0.0005 ug/l (x10 dilution to low level)	Post PAC Total Detected PFAS Species PFAS Total Targetted Species (ug/l) Various LOD, x10 dilution to 510 low level. 6:2FTAB (Capstone B), 6:2FTS, PFHxA, 8:2 FTS, PFPeA, PFHpA, PFBA, PFOA, PFHxS, FHSxA, PFNA, PFDA	% Reduction of other identified Compounds (Target > 99%)	Effluent Capture	Effluent Sample Volume
T11	08/04/2025	Final Optimised Process Trial with foaming agent (This trial became the current standard for Tank Scale commissioning)	Contained Stormwater harvested from Lineside Sump or Tank Farm Bund	3.05	58.8	61.85	<0.0065	0.380	99.6%	To Tank	27m ³
T12A	15/05/2025	Operational Standard (As T9, T10, T11) but at larger scale to feed to 1 (ONE) Discharge Tank (B10) - One batch indicative sample only		3.77	85.9	89.67	<0.0065	0.223	99.8%	To Tank	27m ³
T12B	15/06/2025	Operational Standard (As T9, T10, T11) but at larger scale to feed to Discharge Tanks (B11/B12) - One batch indicative sample only		4.53	93	97.53	<0.0065	0.224	99.8%	To Tank	27m ³
T12C	03/06/2025	Operational Standard (As T9, T10, T11) but at larger scale to feed to Discharge Tanks (B13/B14) - One batch indicative sample only		2.39	54.47	56.86	<0.0065	0.480	99.1%	To Tank	27m ³
T13	05/06/2025	Operational Standard (As T9, T10, T11) but at larger scale to feed to Discharge Tanks (B15/B16) - One batch indicative sample only		2.7	76.53	79.23	<0.0065	0.591	95.1%	To Tank	27m ³
T14	09/06/2025	Operational Standard (As T9, T10, T11) but at larger scale to feed to Discharge Tanks (B17/B18) - One batch indicative sample only		2.76	62.58	65.34	<0.0065	0.505	99.2%	To Tank	27m ³

2. The BAT assessments submitted in the determination process note that a reason for not taking ion exchange forward for the secondary treatment process (instead of powdered activated carbon) was the significant uncertainty over the availability of suitable ion exchange resin in the near future.

The BAT Assessment states that “Recent discussions with a global provider confirmed that UK supply of PFAS resins is likely to remain volatile for the next 12 months as manufacturer is currently manufacturing on demand on a quarterly basis only”.

Please provide evidence of the discussions with ion exchange resin suppliers and confirm the continued volatility of the market prevents the use of ion exchange as a suitable method for PFAS treatment.

The statement regarding availability of Resin for Ion Exchange originates from Geosyntec discussing Ion Exchange Resin options with our remediation suppliers back in 2024.

Cornelsen use Resins from Lanxess and Brenntag. Both suppliers publicly market a ready supply, however their practical experience has been that Lanxess do not hold any stock in Europe they manufacture in India to order and lead times can be from 3 to 6 months. Brenntag hold some stock in Denmark and the last enquiry that was made we were informed that they were holding low stock levels, in the region of 6m³, which they stated may be for a specific pre-order client and sometimes some stock may be available for free issue. We also discussed the opportunity with SciDev at the time who were also having large scale manufacturing supply problems with very tentative supply lead in times of a minimum of 12-16 weeks.

These supply chain issues have to be considered in association with wider external factors which the remediation market has had to contend with over recent past including Brexit, Covid and the US export tariff scenarios, all of which result in global supply chain variations being observed within the UK. Based on limited discernible evidence between the two polishing methods in terms

of remediation performance, a powder activated carbon 'Polyclay' was considered to be the best overall solution in terms of performance and availability.

Please feel free to contact me should you wish to discuss this further.

Best wishes – [REDACTED]

[REDACTED]

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