

ENVIROMAIL # 28

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**Super Ultra Trace PAHs in Water –
Benzo(a)Pyrene to 0.005 µg/L.
Plus Key Sampling Considerations.**

The analysis of PAHs in water is an important test in the environmental industry with many different LORs available commercially. For many years, meeting let alone exceeding the lowest guideline limits has however proved difficult. ALS is pleased to announce a new service through the Sydney facility that not only meets but exceeds the guideline to provide additional confidence at the guideline limit. The following information summarises the new test, relevant guidelines and key considerations when sampling.

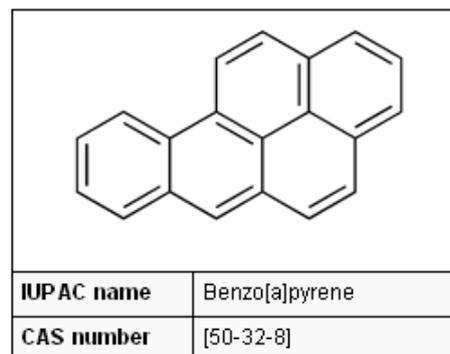
New ALS LORs and relevant guidelines.

The following summarises the LORs requested in major guidelines.

<u>Guideline</u>	<u>Year</u>	<u>Table</u>	<u>Benzo(a)pyrene Guideline Value</u>	<u>ALS LOR</u>
ANZECC Guidelines for Fresh and Marine Water Quality	2000	5.2.3	0.01 µg/L	0.005 µg/L
NEPC Schedule B1 - Guideline on the Investigation Levels for Soil and Groundwater	1999	B5	0.00001 mg/L	0.005 µg/L or 0.000005 mg/L
Australian Drinking Water Guidelines	2004	Under PAHs	0.00001 mg/L	0.005 µg/L

What is benzo(a)pyrene? ⁽¹⁾

Benzo(a)pyrene, C₂₀H₁₂, is a five-ring polycyclic aromatic hydrocarbon that is mutagenic and highly carcinogenic. It is a crystalline yellow solid. Benzo(a)pyrene is a product of incomplete combustion at temperatures between 300 and 600 °C. Benzo(a)pyrene was determined in 1933 to be the component of coal tar responsible for the first recognized occupation-associated cancers, the sooty warts (cancers of the scrotum) suffered by chimney sweeps in 18th century England. In the 19th century, high incidences of skin cancers were noted among fuel industry workers. By the early 20th century, the toxicity of benzo(a)pyrene was demonstrated when malignant skin tumors were produced in laboratory animals by repeatedly painting them with coal tar.





Super Ultra trace PAHs – Key Sampling Considerations.

With analysis of PAHs, and in particular Benzo(a)pyrene (BaP) at part pre trillion (PPT) levels, sample preparation is critical particularly in matrices containing suspended sediment. In many ground waters, particularly where wells are developed in potentially contaminated soil, the inclusion of a small amount of sediment in the sample container can have a significant effect on overall results. Table 1 summarises the effects of a small amount of sediment on a one litre analysis portion. ⁽¹⁾This assumes that 50% of the Benzo(a)pyrene will be extracted from the surface of the suspended soil/sediment into the solvent during the water analysis extraction process.

Suspended Solids Concentration (mg/L)	B(a)P Concentration in the soil (mg/kg)	B(a)P recovered from the suspended solids (µg) ⁽¹⁾	B(a)P reported concentration in water due to solids 'False Positive'	B(a)P Guideline Value
20	2 mg/kg	0.02	0.02 µg/L	0.01 µg/L
20	20mg/kg	0.20	0.20 µg/L	
100	2 mg/kg	0.10	0.10 µg/L	
100	20mg/kg	1.00	1.00 µg/L	

As demonstrated above, Benzo(a)pyrene results can be significantly influenced by the presence of traces of soil/solids. Solids loadings of 105mg/L to 13,000mg/L were found in five random ground waters received by ALS in recent weeks and in such cases the impact on results could be very significant.

Discussion

The choice of sampling techniques when determining Super-ultra-trace level PAHs clearly requires careful consideration. In some cases it may be a requirement to include the suspended solids within the analysis portion, as the 'total' PAH load may be the desired measure. In other cases, the 'dissolved' PAHs may be of interest and this may warrant separation and exclusion of sediment from the analysis portion and/or determination of the ground water sediment load.

Method Scope / Suitability

This analysis is intended for drinking & catchment waters, surface waters and non impacted ground waters. Apart from the sediment load it should be noted that significant TPH background can interfere with Benzo(a)pyrene and trace PAH analysis at PPT levels.

Sample Containers

Two 1,000ml Amber 'Orange' label bottles with Teflon lined lids are a requirement for this analysis. An additional two bottles must be submitted if a duplicate and matrix spike analysis is required.

Requesting Super Ultra-trace PAH analysis from ALS

To receive this service, please quote 'EP132-LL' or request 'B(a)P to 0.005 µg/L' on the COC.

For further details, please contact the Technical Manager or Laboratory Manager at ALS Sydney on (02) 8784 8555 or your local ALS Laboratory.

(1) Acknowledgement: *What is Benzo(a)pyrene?* Wikipedia (<http://en.wikipedia.org/wiki/Benzopyrene>)