ALS Laboratory Group
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Super Ultra-Trace Analysis of Pesticides, Herbicides and Fungicides in Water

For many years, ALS has performed trace organics analyses using GC/MS and LC/MS techniques, with limits of reporting at 0.002 to 0.02µg/L. Following an extensive R&D programme, ALS has received NATA accreditation for a wide range of pesticides down to LORs that can only be described as global best practice. These new LORs (detection limits), as low as 0.2ppt or 0.0002µg/L using LC/MS/MS technologies, are available for a range of pesticides, fungicides and herbicides with a number of additional analytes currently under development.

Background

With increasing focus on the protection of the environment and dwindling water supplies in some regions of Australia, catchment monitoring, drinking water and recycled water analysis needs have changed in recent years. These changes have seen increased demand for very low level pesticide analyses – particularly in catchment and recycled water projects. In addition, new concerns over pristine environments have seen lower level pesticide analyses requested on environmental projects. As a result, many organisations monitoring trace organics now look to laboratories to provide not only services that meet regulatory requirements (e.g. ADWG), but to also test down to levels that see LORs 500 to 1000 times lower that the prescribed limits. This provides increased confidence, the ability to react to increasing concentrations in water bodies before regulatory limits are reached and a greater ability to monitor environmental outputs and evaluate these against the very low limits often set in ANZECC.

Multi Residue and Triazine Pesticides	Super Ultra Trace Typical LORs (µg/L)
ALS METHOD CODE	**EP234–LL**
OP Pesticides	0.0002 – 0.001
Thiocarbamates	0.0002
Dinotroanilines	0.001
Triazinone Herbicides	0.0002
Conazole Fungicides	0.0002
Phenylureas	0.0002
Triazine Herbicides	0.0002

Analysis by LC/MS/MS

The analysis of these Pesticides and Herbicides concludes a long term R&D project to optimise LORs and provide high quality precision at part per trillions level. The success of this project is highlighted by precision data which shows typical RPDs of less than 10% and excellent recoveries even at these incredibly low LORs.

Right solutions….
….Right partner

Meeting Industry Guidelines

The following table shows ANZECC 2000 trigger values for toxicants at various levels of protection. Many requirements can now be exceeded with reported detection limits substantially below the guideline values.

Chemical		Trigger values for freshwater (μgL^{-1})				Trigger values for marine water (μgL^{-1})			
		Level of protection (% species)				Level of protection (% species)			
		99%	95%	90%	80%	99%	95%	90%	80%
ORGANOPHOSPHORUS PESTICIDES									
Azinphos methyl		0.01	0.02	0.05	0.11 [A]	ID	ID	ID	ID
Chlorpyrifos	B	0.00004	0.01	0.11 [A]	1.2 [A]	0.0005	0.009	0.04 [A]	0.3 [A]
Demeton		ID	ID	ID	ID	ID	ID	ID	ID
Demeton-S-methyl		ID	ID	ID	ID	ID	ID	ID	ID
Diazinon		0.00003	0.01	0.2 [A]	2 [A]	ID	ID	ID	ID
Dimethoate		0.1	0.15	0.2	0.3	ID	ID	ID	ID
Fenitrothion		0.1	0.2	0.3	0.4	ID	ID	ID	ID
Malathion		0.002	0.05	0.2	1.1 [A]	ID	ID	ID	ID
Parathion		0.0007	0.004 [C]	0.01 [C]	0.04 [A]	ID	ID	ID	ID
Profenofos	B	ID	ID	ID	ID	ID	ID	ID	ID
Temephos	B	ID	ID	ID	ID	0.0004	0.05	0.4	3.6 [A]

Limits that can now be met with a good safety margin.

Table 10.11 Guideline values for pesticides

Pesticide	Guideline value[a] (mg/L)	Health value[b] (mg/L)
Atrazine	0.0001	0.04
Molinate	0.0005	0.005
Propazine	0.0005	0.05
Propiconazole	0.0005	0.1
Simazine	0.0005	0.02
Trifluralin	0.0001	0.05

The above table shows some selected ADWG pesticide guideline values. While the units are different, technology now allows ALS methods to detect pesticides well below these limits, often by a factor of 500 to 1000 times to provide water providers with absolute confidence.

General Sampling Requirements

Sample collection is important with these analyses and a single 500mL amber bottle is required per analysis at these super ultra trace levels. Additional pairs are required where matrix spikes and duplicate analyses are requested.

For further information please contact the ALS Technical Manager or your local ALS team.

References

1. Australian Drinking Water Guidelines 2004
   Chapter 10 – Monitoring for Specific Characteristics in Drinking Water (pages 27-28)
2. ANZECC 2000
   Chapter 3.4 – Water Quality Guidelines for Toxicants (pages 5 – 10)