Murdoch University
Marine and Freshwater Research Laboratory

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Charges for Analytical Services

NATA Accredited Laboratory No.10603

NOTE: A $60 minimum charge will apply to all sample batches.

Water

Total Nitrogen (TN-Persulphate) (<50 µg.N.L^{-1})	24.00
* Total Kjeldahl Nitrogen (TKN) (<200 µg.N.L^{-1})	24.00
Ammonium (NH_4-N) (<3 µg.N.L^{-1})	15.00
Nitrate plus Nitrite (NO_3-N + NO_2-N) (<2 µg.N.L^{-1})	15.00
Nitrite (NO_2-N) (<2 µg.N.L^{-1})	15.00
Nitrate (NO_3-N) (<2 µg.N.L^{-1})	30.00
Total Phosphorus (TP-Persulphate) (<5 µg.P.L^{-1})	24.00
Orthophosphate (FRP) (PO_4-P) (<2 µg.P.L^{-1})	15.00
Chlorophyll a, b, c (trichromatic,) (<0.1 µg.L^{-1})	24.00
Chlorophyll 'a' (acid correction, phaeophytin) (<0.1 µg.L^{-1})	24.00
Sulphate (SO_4) (<1 mg.L^{-1})	15.00
Silicate (SiO_3) (<2 µg.Si.L^{-1})	15.00
Turbidity (<0.1 NTU)	8.00
Colour (<0.1gilvin 440m^{-1})	10.00
pH (<0.1)	8.00
Conductivity/Salinity	8.00
Chloride (Cl) (<1 mg.Cl.L^{-1})	15.00
Fluoride (F) (<0.05 mg.F.L^{-1})	25.00
Total Organic Carbon (TOC/DOC as NPOC)(<0.6 mg.C.L^{-1})	30.00
Dissolved Inorganic Carbon (DIC) (<0.6 mg.C.L^{-1})	30.00
Total Suspended Solids (TSS)	15.00
Total Dissolved Solids (TDS)	16.00
Sample preparation (filtering)	8.00
Sulphide (<0.02 mg.S^{2}-.L^{-1})	45.00
Alkalinity (<2 mg.$CaCO_3$/L) (bicarbonate, carbonate and hydroxide)	22.00
Acidity (<2 mg.$CaCO_3$/L)	22.00
* Fluorometric Analysis: Rhodamine dye, Chlorophyll a, Crude Oil, Phycocyanin, CDOM, Low level Ammonia in seawater (<0.5µg.N.L^{-1})	POA

Sediment and Plant Material

Total Kjeldahl Nitrogen (TKN) (<0.1 mg.N.g^{-1})	28.00
Total Phosphorus (TP)(<0.05 mg.P.g^{-1})	28.00
Total Organic Carbon (<0.2% TOC)	40.00
Sample preparation (Freeze drying and grinding)	18.00
* Sediment Chlorophyll 'a'	32.00
* Wet Weight, Dry Weight, Loss on Ignition 550°C and 1000°C	24.00
Particle Size Distribution (Laser Diffraction 0.02 – 500 µm) and wet sieving to 16mm	130.00

*** Note tests marked with ' * ' are not covered under the scope of NATA accreditation**

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ICP-AES Analysis

Digestion/Extraction/Elutriation 25.00

Trace Elements by ICP-AES 10.00 per sample + 2.20 per element

Reporting Limits for Solutions (Dissolved or Total Acid Extractable)

Ag (0.01 mg.L^{-1})	Co (0.002 mg.L^{-1})	Mo (0.004 mg.L^{-1})	Ti (0.001 mg.L^{-1})
Al (0.01 mg.L^{-1})	Cr (0.001 mg.L^{-1})	Ni (0.007 mg.L^{-1})	Tl (0.02 mg.L^{-1})
As (0.02 mg.L^{-1})	Cu (0.001 mg.L^{-1})	Pb (0.01 mg.L^{-1})	V (0.002 mg.L^{-1})
Au (0.01 mg.L^{-1}) *	Fe (0.002 mg.L^{-1})	Sb (0.02 mg.L^{-1})	Zn (0.002 mg.L^{-1})
Ba (0.0004 mg.L^{-1})	Fe Total(0.1 mg.L^{-1})	Se (0.02 mg.L^{-1})	Zn Total (0.005 mg.L^{-1})
Be (0.0001 mg.L^{-1})	Li (0.01 mg.L^{-1})	Sn (0.02 mg.L^{-1})	
Cd (0.0006 mg.L^{-1})	Mn (0.0002 mg.L^{-1})	Sr (0.001 mg.L^{-1})	

Major Elements by ICP-AES 10.00 per sample + 2.20 per element

Reporting Limits for Solutions (Dissolved elements)

B (0.006 mg.L^{-1})	K (0.05 mg.L^{-1})	Na (0.05 mg.L^{-1})	S (0.05 mg.L^{-1})
Ca (0.005 mg.L^{-1})	Mg (0.005 mg.L^{-1})	P (0.02 mg.L^{-1})	Si (0.02 mg.L^{-1}) *

Reporting Limits for digested Soils and Sediments
(Aqua Regia Extractable or Dilute Acid Extractable)

Ag (1 mg.kg^{-1})	Co (0.2 mg.kg^{-1})	Mo (0.5 mg.kg^{-1})	Sn (2 mg.kg^{-1})
Al (2 mg.kg^{-1})	Cr (0.2 mg.kg^{-1})	Na (10 mg.kg^{-1})	Sr (0.1 mg.kg^{-1})
As (2 mg.kg^{-1})	Cu (0.2 mg.kg^{-1})	Ni (0.7 mg.kg^{-1})	Ti (0.1 mg.kg^{-1})
Ba (0.1 mg.kg^{-1})	Fe (5 mg.kg^{-1})	P (2 mg.kg^{-1})	Tl (2 mg.kg^{-1})
Be (0.01 mg.kg^{-1})	K (5 mg.kg^{-1})	Pb (1 mg.kg^{-1})	V (0.2 mg.kg^{-1})
Bi (2 mg.kg^{-1})	Li (1 mg.kg^{-1})	S (10 mg.kg^{-1})	Zn (0.5 mg.kg^{-1})
Ca (10 mg.kg^{-1})	Mg (2 mg.kg^{-1})	Sb (2 mg.kg^{-1})	
Cd (0.1 mg.kg^{-1})	Mn (0.05 mg.kg^{-1})	Se (2 mg.kg^{-1})	

Reporting Limits for Biota – as for soils and sediments except:

Al (3 mg.kg^{-1})	Fe (1 mg.kg^{-1})	Mn (0.1 mg.kg^{-1})	P (10 mg.kg^{-1})
Cr (0.5 mg.kg^{-1})	Mg (5 mg.kg^{-1})	Mo (0.4 mg.kg^{-1})	Zn (2 mg.kg^{-1})

Mercury by Cold-Vapour Generation ICP-AES 30.00 per element

Reporting Limits for solutions
Hg (< 0.0001 mg.L^{-1})

For soils, sediments and biota
Hg (<0.01 mg.kg^{-1})

* Hardness by calculation from calcium and magnesium 12.00 per sample
* Lead Isotope Ratio 70.00 per sample
* Diffusive Gradients in Thin Films (DGT) – Trace metal analysis POA

* Note tests marked with ' * ' are not covered the scope of NATA accreditation

Reporting limits assume direct analysis of samples as received or at minimum levels of dilution and that there are no significant interferences from the sample matrix.

Ultra trace analysis of heavy metals in marine and estuarine waters

The Marine and Freshwater Research Laboratory (MAFRL) at Murdoch University is capable analysing marine and estuarine waters to ultra-trace levels of metals using an Agilent 7700x ICP-MS. MAFRL has also attained NATA accreditation for this technique. This technique is applicable for analysis to ANZECC triggers levels for 99% protection of species and baseline studies to determine background concentrations.

MAFRL's Reporting Limits for marine and estuarine waters.

	Element Symbol	Reporting Limit $\mu g.L^{-1}(10\sigma)$	ANZG (2018) default guideline values	
			99%	95%
Beryllium	Be	1	No value	No value
Aluminium	Al	5	No value	No value
Titanium	Ti	1	No value	No value
Vanadium	V	0.3	50	100
Chromium	Cr	0.2	No value	No value
Chromium (III) #	CrIII	2	7.7	27
Chromium (VI) #	CrVI	2	0.14	4.4
Manganese	Mn	0.5	No value	No value
Iron	Fe	1	No value	No value
Cobalt	Co	0.05	0.005	1
Nickel	Ni	0.3	7	70
Copper	Cu	0.2	0.3	1.3
Zinc	Zn	1	3.3	8.0
Gallium	Ga	1	No value	No value
Arsenic	As	0.5	No value	No value
Selenium	Se	1	No value	No value
Molybdenum	Mo	0.5	No value	No value
Silver	Ag	0.1	0.8	1.4
Cadmium	Cd	0.1	0.7	5.5
Tin	Sn	1	No value	No value
Antimony	Sb	0.5	No value	No value
Barium	Ba	0.5	No value	No value
Lanthanum	La	0.2	No value	No value
Thallium	Tl	0.1	No value	No value
Lead	Pb	0.1	2.2	4.4
Bismuth	Bi	0.1	No value	No value
Uranium	U	0.2	No value	No value
Mercury *	Hg	0.1	0.1	0.4

* Mercury analysed using CV-ICP-AES

Chromium VI analysed using colourimetric method, chromium (III) calculated by difference

Typically the high TDS matrix of seawater provides a challenge for laboratories attempting metal analysis and often low reporting limits cannot be achieved. MAFRL's method is designed for this matrix and has been validated using seawater and certified reference materials of seawater. The test requires as little as 20mL of sample, reducing filtering times and sample transportation issues.

Price: **$55 + $5.50 per element per sample**
Mercury: **$30 per sample**
Chromium VI: **$30 per sample**

Trace analysis of heavy metals in sediments

The Marine and Freshwater Research Laboratory at Murdoch University is capable of analysing trace levels of metals using an Agilent 7700x ICP-MS. MAFRL has also attained NATA accreditation for this technique. This technique is applicable for analysis to ANZECC triggers levels for sediments, NADG guidelines and baseline studies to determine background concentrations.

Reporting limits for sediments.

Element	Symbol	Reporting Limit $mg.kg^{-1}$ (10σ)	NADG	ANZECC trigger levels (2000)	
			Required PQL	ISQG-Low	ISQG-High
Aluminium	Al	5	200		
Titanium	Ti	0.5			
Vanadium	V	0.1	2		
Chromium	Cr	0.2	1	80	370
Manganese	Mn	0.2	10		
Iron	Fe	2	100		
Cobalt	Co	0.1	0.5		
Nickel	Ni	0.2	1	21	52
Copper	Cu	0.2	1	65	270
Zinc	Zn	1	1	200	410
Arsenic	As	0.1	1	20	70
Selenium	Se	0.1	0.1		
Molybdenum	Mo	0.1			
Silver	Ag	0.02	0.1	1	3.7
Cadmium	Cd	0.02	0.1	1.5	10
Tin	Sn	0.5			
Antimony	Sb	0.2	0.5	2	25
Barium	Ba	0.2			
Thallium	Tl	0.02			
Lead	Pb	0.1	1	50	220
Bismuth	Bi	0.02			
Uranium	U	0.1			
Mercury *	Hg	0.01	0.01	0.15	1

*Mercury analysed using CV-ICP-AES

MAFRL's method is designed for this matrix and has been validated using certified reference materials of sediment. MAFRL can also perform elutriation and dilute acid extraction on sediments for bioavailability.

Price:

Sample preparation (Freeze drying and grinding):	**$18 per sample**
Sample digestion (total extractable/dilute acid extractable):	**$25 per sample**
Analysis:	**$30 + $3 per element per sample**
Mercury:	**$30 per sample**

Other Charges

Field Sampling Services

ADAS commercial SCUBA divers (Part I and Part II)	110.00/hr
ADAS commercial Part I dive supervisor	110.00/hr
Scientific field personnel	110.00/hr
Vehicle hire (Toyota Landcruiser)	1.00/km
Vehicle hire (Ford Ranger)	1.00/km
Research vessel 7.85m (Pelagic 440884)	600.00/day
Research vessel 6.6m (Assassin 440752)	600.00/day

Water Quality Sampling Equipment

Filter tower (for TSS and Chl 'a' with hand vacuum pump)	15.00/day
Filter tower (for TSS and Chl 'a' with 12V vacuum pump)	20.00/day
Niskin bottle 6L (internal release with 25m rope and messenger)	30.00/day
Niskin bottle 10L (externally sprung with dyneema and messenger)	30.00/day
Secchi disk (20cm)	5.00/day
GF/C filter papers Whatman (47mm x 1.2µm) (box 100)	60.00
Syringe - Rubber plunger (60mL) for nutrients	3.00
Syringe - Polyethylene plunger (30mL) for trace metals	5.00
Syringe filters disposable PES (26mm x 0.45µm, 5.3cm^2)	1.50
Deionised pure water	2.00/litre
Waterproof Sample labels on request	

Water Quality Profiling Equipment

Sea-Bird SBE *19plus* V2 –100m depth rating (Depth, pH, Ec, Salinity, Temp, DO, Turbidity, Fluorometer – Chlorophyll 'a') [6]	$250/day
Sea-Bird SBE *19plus* V2 – 600m depth rating (Depth, pH, Ec, Salinity, Temp, DO, Turbidity, PAR, Chlorophyll 'a', Crude oil, Rhodamine) 6	$250/day
Sea-Bird SBE *19plus* V2 –1000m depth rating (Depth, pH, Ec, Salinity, Temp, DO, Turbidity, PAR, Chlorophyll 'a', Crude oil, Rhodamine) 6	$250/day
Li-Cor light array –1m and 7m (2 x underwater PAR sensors for instantaneous light attenuation with LI-COR logger) 6	$150/day

Water Quality Moored Equipment

Sea-Bird SBE *16plus* V2 –100m depth rating (Depth, Conductivity, Salinity, Temperature, Wetlabs-Turbidity, Wetlabs-PAR)	POA
Sea-Bird SBE *37-SMP MicroCAT* – 7000m depth rating (Conductivity, Salinity, Temperature)	POA

Water Quality Equipment Calibration Services

A range of calibrations and checks are available including;

- Turbidity calibrations and checks of various loggers with standards prepared from primary Formazin (4000 NTU).
- PAR light loggers (Odyssey, Wetlabs, Li-Cor) calibrated against standard light calibration source.
- Salinity and Temperature checks of CTD equipment against IAPSO calibrated seawater (± 0.1 psu) and NATA accredited thermometers (± 0.1°C).

Sediment Sampling Equipment

Polycarbonate corers (44.5mmÆ, 30cm long, with rubber bungs)	10.00/day
Polycarbonate corers (94mmÆ, 15cm long with rubber bungs)	10.00/day
Ekman Grab (150x150mm, 50m rope)	50.00/day
Petite Ponar (150x150mm, 30m rope)	50.00/day
Van Veen Grab (225x200mm, 0.05m^2, 3 litre sample volume, 13kg dry)	50.00/day

Video Equipment

Drop down underwater video camera on towed body with GPS overlay (300ft cable) [6]	250.00/day

Conditions

1. The Marine and Freshwater Research Laboratory will advise how these samples are to be collected, stored and submitted for analysis but accepts no responsibility if these procedures are not followed. The result of the analysis will be for the sample as received.
2. There will be a surcharge if the samples require special treatment prior to analysis (eg filtering, centrifuging, drying, grinding, etc).
3. Students currently studying at tertiary institutions may receive a discount of up to 25% on any or all of these charges. Proof of enrolment or a letter from the supervisor is required.
4. GST is not included in the above pricing schedule and is applicable at a rate of 10%.
5. Minimum charge is $60 ($30 for students).
6. This field equipment only available with MAFRL field personnel