ENVIRONMENT

Reference Materials **Catalogue 2026**

Environment

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Environment

Ash Materials

LGC6180	Pulverised fuel ash

Carbon Isotope Ratio Materials

ERM-AE672	Glycine - absolute carbon isotope ratio
LGC171-KT	Glycine solutions - absolute carbon isotope ratio

Drinking Water Materials

LGC6012	Hard drinking water - anions
LGC6013	Soft drinking water - anions
LGC6026	Hard drinking water - metals
LGC6027	Soft drinking water - metals
LGC6028	Hard drinking water - low level metals

Environment Purity Materials

ERM-AC820	3,3',4,4'-tetrachlorobiphenyl (PCB77)
ERM-AC821	3,3',4,4',5-pentachlorobiphenyl (PCB 126)
ERM-AC822	3,3',4,4',5,5'-hexachlorobiphenyl (PCB 169)
ERM-AC823	Polychlorinated biphenyls in 2,2,4 -Trimethylpentane (iso-octane)
LGC1801	Nicotine

Fresh Water Materials

LGC6020	River water - anions
LGC6025	River water - anions

Environment

Miscellaneous Water Materials

LGC6016	Estuarine water - metals
LGC6177	Landfill leachate - metals

Sediment Materials

LGC6187	River sediment - metals
LGC6188	River sediment - PAHs
LGC6189	River sediment - extractable metals

Sewage Sludge Materials

ERM-CC136	Sewage sludge - metals
LGC6181	Sewage sludge - extractable metals
LGC6182	Sewage sludge - PAHs
LGC6184	Sewage sludge - PCBs

Soil Materials

ERM-CC135	Contaminated brickworks soil - metals
LGC6115	Contaminated soil PCBs and PAHs
LGC6145	Contaminated clay loam soil - extractable metal, PAHs and inorganics
LGCQC3013	Loamy sand soil 2 - total petroleum hydrocarbons

Environment

Ash Materials

Pulverised fuel ash
LGC6180

Batch: 001
Unit size: 50 g

Pulverised fuel ash is a waste product of coal-fired power stations. This material was obtained from a disposal site near Camarthan Bay in South Wales, UK. The material was dried and ground to less than 250 µm particle size.

This material is intended for use in development, validation or quality control of analytical methods for the determination of the extractable metal content in ash-based material. The material may also be applicable to other matrices where suitable reference materials are not available.

UKAS REFERENCE MATERIALS
4005

Assessed values: *Extractable metal content*			
Aluminium	25700 ± 6300 mg/kg	Magnesium	3660 ± 440 mg/kg
Arsenic	91.7 ± 14.1 mg/kg	Manganese	259 ± 40 mg/kg
Barium	676 ± 92 mg/kg	Nickel	48.4 ± 12.5 mg/kg
Calcium	6415 ± 530 mg/kg	Potassium	6170 ± 1680 mg/kg
Chromium	43.8 ± 11.7 mg/kg	Sodium	1230 ± 480 mg/kg
Cobalt	18.5 ± 4.3 mg/kg	Vanadium	105 ± 15 mg/kg
Copper	67.9 ± 11.2 mg/kg	Zinc	115 ± 21 mg/kg
Lead	48.6 ± 11.3 mg/kg		

Indicative values: *Extractable metal content*			
Antimony	12 mg/kg	Lithium	46 mg/kg
Beryllium	2.3 mg/kg	Mercury	0.5 mg/kg
Boron	25 mg/kg	Selenium	2 mg/kg
Iron	32900 mg/kg	Titanium	610 mg/kg

Indicative values: *Total metal content*			
Aluminium	13100 mg/kg	Magnesium	8500 mg/kg
Antimony	16 mg/kg	Manganese	410 mg/kg
Arsenic	100 mg/kg	Molybdenum	5 mg/kg
Barium	1300 mg/kg	Nickel	110 mg/kg
Beryllium	6 mg/kg	Potassium	29600 mg/kg
Calcium	9200 mg/kg	Selenium	3 mg/kg
Chromium	140 mg/kg	Sodium	5100 mg/kg
Cobalt	41 mg/kg	Tin	7 mg/kg
Copper	130 mg/kg	Titanium	4400 mg/kg
Iron	52400 mg/kg	Vanadium	260 mg/kg
Lead	110 mg/kg	Zinc	260 mg/kg
Lithium	130 mg/kg		

Carbon Isotope Ratio Materials

Glycine – absolute carbon isotope ratio
ERM®- AE672

Batch: a
Unit size: 0.5 g

The material was prepared from a single batch of commercially available high purity glycine and dispensed as ≥ 0.5 g units.

This material is intended for use in the calibration of instruments, the validation of new methods and the monitoring of the performance of methods used for the determination of carbon isotope ratios. It can also be used for the training and evaluation of staff.

4005

Certified value:	
$n(^{13}C)/n(^{12}C)$ (ratio)	0.010648 ± 0.000031

Additional material data:	
$\delta_{13}C_{VPDB\text{-}LSVEC}$	- 42.12 ± 0.42 (‰)

Glycine solution– absolute carbon isotope ratio
LGC171- KT

Batch: 001
Unit size: 0.5 g

The materials were prepared using commercially available high purity glycines dissolved in 0.08 M phosphoric acid. For each solution the glycine mass concentration is approximately 150g/L.

This reference material kit is primarily intended for use in the calibration of instruments for the determination of bulk absolute carbon isotope ratios. The kit can also be used for validation of new methods, monitoring of the performance of methods and for the training and evaluation of staff.

4005

Certified values: $n(^{13}C)/n(^{12}C)$ ratio for:			
LGC1711	0.010642 ± 0.000030	LGC1712	0.010821 ± 0.000030
LGC1713	0.011227 ± 0.000032		

Indicative values: $\delta_{13}C_{VPDB\text{-}LSVEC}$			
LGC1711	-42.13 ± 0.26 (‰)	LGC1712	-24.62 ± 0.23 (‰)
LGC1713	+12.55 ± 0.21 (‰)		

Drinking Water Materials

Hard drinking water – anions
LGC6012

Batch: 004
Unit size: 250 mL

Hard drinking water was sourced from the Teddington (Greater London, UK) potable mains supply. The water was filtered through a set of 8 µm, 1.2 µm and 0.45 µm in-line filters and preserved with the addition of copper sulfate to a final concentration of 1 mg/L as copper. High purity salt standards were used to spike the base material to reach the target levels, which reflect the regulatory limits in the European Drinking Water Directive and the UK Water Supply (Water Quality) Regulations 2016.

This reference material is primarily intended for use in the development, validation or quality control of analytical methods for the determination of anions in hard drinking water.
The material may also be applicable to other similar matrices where more closely matched reference materials are not available.

UKAS REFERENCE MATERIALS
4005

Certified values:			
Ammonium	0.412 ± 0.024 mg/L	Nitrate	49.4 ± 1.1 mg/L
Chloride	246.5 ± 5.8 mg/L	Sulfate	246.9 ± 8.8 mg/L
Fluoride	1.36 ± 0.11 mg/L		

Additional information:			
pH	8.0	Hardness	265 mg/L as $CaCO_3$
Conductivity	1580 µS/cm	Density	0.99814 g/cm^3

Soft drinking water – anions
LGC6013

Batch: 004
Unit size: 250 mL

Soft drinking water was sourced from the Bury (Greater Manchester, UK) potable mains supply. The water was filtered through a set of 8 µm, 1.2 µm and 0.45 µm in-line filters and preserved with the addition of copper sulfate to a final concentration of 1 mg/L as copper. High purity salt standards were used to spike the base material to reach the target levels, reflecting the regulatory limits in the European Drinking Water Directive and the UK Water Supply (Water Quality) Regulations 2016.

This reference material is primarily intended for use in the development, validation or quality control of analytical methods for the determination of anions in soft drinking water.
The material may also be applicable to other similar matrices where more closely matched reference materials are not available.

UKAS REFERENCE MATERIALS
4005

Certified values:			
Ammonium	0.441 ± 0.015 mg/L	Nitrate	48.89 ± 0.91 mg/L
Chloride	243.4 ± 7.0 mg/L	Sulfate	248.1 ± 8.4 mg/L
Fluoride	1.449 ± 0.099 mg/L		

Additional information:			
pH	7.2	Hardness	37 mg/L as $CaCO_3$
Conductivity	1380 µS/cm	Density	0.99789 g/cm^3

Hard drinking water UK–metals
LGC6026

Batch: 003
Unit size: 250 mL

Hard drinking water was sourced from Lichfield (Staffordshire, UK) potable mains supply. The water was filtered through a set of 8 µm, 1.2 µm and 0.45 µm in-line filters and acidified by addition of nitric acid to give a final concentration of approximately 0.1% nitric acid and pH <2.0. High purity metal standards were used to spike the base material to reach the target levels, reflecting the regulatory limits in the European Drinking Water Directive and the UK Water Supply (Water Quality) Regulations 2016.

UKAS REFERENCE MATERIALS
4005

This reference material is primarily intended for use in the development, validation or quality control of analytical methods for the determination of metals in hard drinking water. The material may also be applicable to other similar matrices where more closely matched reference materials are not available.

Certified values:			
Aluminium	199.9 ± 6.1 µg/L	Lithium	11.24 ± 0.58 µg/L
Antimony	4.99 ± 0.17 µg/L	Magnesium	18.50 ± 0.76 mg/L
Arsenic	10.00 ± 0.31µg/L	Manganese	48.4 ± 1.5 µg/L
Barium	116.1 ± 3.5 µg/L	Molybdenum	4.77 ± 0.25 µg/L
Beryllium	5.08 ± 0.26 µg/L	Nickel	19.00 ± 0.72 µg/L
Boron	983 ± 26 µg/L	Potassium	5.30 ± 0.15 mg/L
Cadmium	4.98 ± 0.15 µg/L	Selenium	10.19 ± 0.59 µg/L
Calcium	77.1 ± 2.2 mg/L	Sodium	24.60 ± 0.79 mg/L
Chromium	50.0 ± 1.9 µg/L	Strontium	491 ± 20 µg/L
Cobalt	4.88 ± 0.17 µg/L	Thallium	5.11 ± 0.42 µg/L
Copper	2017 ± 56 µg/L	Uranium	4.95 ± 0.40 µg/L
Iron	198.4 ± 5.5 µg/L	Vanadium	4.96 ± 0.15 µg/L
Lead	9.98 ± 0.14 µg/L	Zinc	621 ± 19 µg/L

Soft drinking water – metals
LGC6027

Batch: 001
Unit size: 250 mL

Soft drinking water was sourced from the Bury (Lancashire, UK) potable mains supply. The water was filtered through a set of 8 µm, 1.2 µm and 0.2 µm in-line filters and acidified by addition of nitric acid to give a final concentration of approximately 0.1% nitric acid and pH <2.0. High purity metal standards were used to spike the base material to reach the target levels, reflecting the regulatory limits in the European Drinking Water Directive and the UK Water Supply (Water Quality) Regulations 2016.

UKAS REFERENCE MATERIALS
4005

This reference material is primarily intended for use in the development, validation or quality control of analytical methods for the determination of metals in soft drinking water. The material may also be applicable to other similar matrices where more clearly matched reference materials are not available.

Certified values:			
Aluminium	196.1 ± 7.3 µg/L	Manganese	49.9 ± 1.1 µg/L
Antimony	5.21 ± 0.24 µg/L	Molybdenum	4.62 ± 0.40 µg/L
Arsenic	10.00 ± 0.35 µg/L	Nickel	20.01 ± 0.50 µg/L
Barium	115.7 ± 3.5 µg/L	Selenium	10.21 ± 0.39 µg/L
Beryllium	5.09 ± 0.22 µg/L	Strontium	496 ± 24 µg/L
Boron	1006 ± 49 µg/L	Thallium	4.88 ± 0.32 µg/L
Cadmium	5.09 ± 0.24 µg/L	Uranium	4.95 ± 0.26 µg/L
Chromium	49.9 ± 1.1 µg/L	Vanadium	4.93 ± 0.21 µg/L
Cobalt	4.87 ± 0.17 µg/L	Zinc	613 ± 19 µg/L
Copper	1995 ± 66 µg/L	Calcium	8.53 ± 0.16 mg/L
Iron	200.0 ± 2.6 µg/L	Magnesium	1.026 ± 0.035 mg/L
Lead	10.15 ± 0.20 µg/L	Potassium	0.367 ± 0.023 mg/L
Lithium	10.41 ± 0.64 µg/L	Sodium	4.36 ± 0.29 mg/L

Hard drinking water – metals (lower levels) LGC6028

Batch: 001
Unit size: 250 mL

Hard drinking water was sourced from the Tamworth (Staffordshire, UK) potable mains supply. The water was filtered through a set of 8 µm, 1.2 µm and 0.45 µm in-line filters and acidified by addition of nitric acid to give a final concentration of approximately 0.1% nitric acid and pH <2.0. High purity metal standards were used to spike the base material to reach the target levels, reflecting the regulatory limits in the European Drinking Water Directive and the UK Water Supply (Water Quality) Regulations 2016.

UKAS REFERENCE MATERIALS
4005

This reference material is primarily intended for use in the development, validation or quality control of analytical methods for the determination of metals in hard drinking water. The material may also be applicable to other similar matrices where more closelymatched reference materials are not available.

Certified values:			
Aluminium	20.1 ± 1.3 µg/L	Molybdenum	2.20 ± 0.13 µg/L
Antimony	5.02 ± 0.18 µg/L	Nickel	4.85 ± 0.21 µg/L
Arsenic	4.98 ± 0.18 µg/L	Selenium	5.13 ± 0.31 µg/L
Barium	92.8 ± 3.1 µg/L	Strontium	193.8 ± 7.8 µg/L
Beryllium	2.05 ± 0.12 µg/L	Thallium	4.98 ± 0.33 µg/L
Boron	76.2 ± 3.7 µg/L	Uranium	4.90 ± 0.30µg/L
Cadmium	0.970 ± 0.042 µg/L	Vanadium	1.908 ± 0.098 µg/L
Chromium	9.76 ± 0.43 µg/L	Zinc	58.2 ± 2.0 µg/L
Cobalt	4.66 ± 0.15 µg/L	Calcium	79.6 ± 1.7 mg/L
Copper	36.0 ± 1.7 µg/L	Magnesium	13.30 ± 0.48 mg/L
Lead	1.033 ± 0.025 µg/L	Potassium	4.91 ± 0.11 mg/L
Lithium	10.44 ± 0.56 µg/L	Sodium	23.47 ± 0.64 mg/L
Manganese	4.74 ± 0.23 µg/L		

Indicative value:	
Iron	20 µg/L

Environment Purity Materials

3,3',4,4'–tetrachlorobiphenyl (PCB77)
ERM®- AC820

Batch: a
Unit size: 0.02 g

A batch of PCB 77, obtained from a commercial supplier was mixed, dried over P_2O_5 and dispensed as 0.02 g units into screw-capped amber glass vials. The purity was assessed by combining data from HPLC and GC.

This material is primarily intended for use as a calibration standard in methods of analysis for PCB 77 in environmental and other relevant matrices.

UKAS REFERENCE MATERIALS
4005

Certified value:	
Purity	99.8 + 0.2/- 0.3 mass %

3,3',4,4',5–pentachlorobiphenyl (PCB 126)
ERM®- AC821

Batch: a
Unit size: 0.02 g

A batch of PCB 126, obtained from a commercial supplier was mixed, dried over P_2O_5 and dispensed as 0.02 g units into screw-capped amber glass vials. The purity was assessed by combining data from HPLC and GC.

This material is primarily intended for use as a calibration standard in methods of analysis for PCB 126 in environmental and other relevant matrices.

UKAS REFERENCE MATERIALS
4005

Certified value:	
Purity	98.9 ± 0.3 mass %

3,3',4,4',5,5'–hexachlorobiphenyl (PCB 169)
ERM®- AC822

Batch: a
Unit size: 0.02 g

A batch of PCB 169, obtained from a commercial supplier was mixed, dried over P_2O_5 and dispensed as 0.02 g units into screw-capped amber glass vials. The purity was assessed by combining data from HPLC and GC.

This material is primarily intended for use as a calibration standard in methods of analysis of PCB 169 in environmental and other relevant matrices.

UKAS REFERENCE MATERIALS
4005

Certified value:	
Purity	99.4 + 0.6 / - 1.3 mass %

Polychlorinated biphenyls in 2,2,4–trimethylpentane (iso-octane)
ERM®- AC823

Batch: a
Unit size: 1.2 mL

This material was prepared by a commercial manufacturer to a specification produced by LGC. High purity PCB (polychlorinated biphenyl) standards were combined gravimetrically to produce a solution containing 15 PCB congeners in 2,2,4-Trimethylpentane (iso-octane).

This material is intended for method validation purposes and for checking instrument calibration for the measurement of polychlorinated biphenyls.

UKAS REFERENCE MATERIALS
4005

Certified values:	
2,4,4’ – trichlorobiphenyl (PCB28)	703 ± 15 µg/kg
2,2’,5,5’ – tetrachlorobiphenyl (PCB52)	706 ± 7 µg/kg
2,2’,4,5,5’ – pentachlorobiphenyl (PCB101)	696 ± 7 µg/kg
2,3’,4,4’,5 – pentachlorobiphenyl (PCB 118)	712 ± 9 µg/kg
2,2’,3,4,4’,5’ – hexachlorobiphenyl (PCB138)	678 ± 37 µg/kg
2,2’,4,4’,5,5 – hexachlorobiphenyl (PCB153)	702 ± 8 µg/kg
2,2’,3,4,4’,5,5’ – heptachlorobiphenyl (PCB180)	700 ± 9 µg/kg

Indicative values:	
2,4',5 - trichlorobiphenyl (PCB31)	697 µg/kg
3,3',4,4 '- tetrachlorobiphenyl (PCB77)	697 µg/kg
2,3,3',4',6 - pentachlorobiphenyl (PCB110)	690 µg/kg
2,2',3,4',5',6 - hexachlorobiphenyl (PCB149)	695 µg/kg
2,3,3',4',5,6 - hexachlorobiphenyl (PCB163)	689 µg/kg
2,2',3,3',4,4',5 - heptachlorobiphenyl (PCB170)	693 µg/kg
2,2',3,4',5,5',6 - heptachlorobiphenyl (PCB187)	693 µg/kg
2,2',3,3',4,4',5,5' - octachlorobiphenyl (PCB194)	693 µg/kg

Calculated values:	
2,4,4’ – Trichlorobiphenyl (PCB28)	487 ± 10 µg/L
2,2’,5,5’ – Tetrachlorobiphenyl (PCB52)	489 ± 5 µg/L
2,2’,4,5,5’ – Pentachlorobiphenyl (PCB101)	481 ± 5 µg/L
2,3’,4,4’,5 – Pentachlorobiphenyl (PCB 118)	493 ± 7 µg/L
2,2’,3,4,4’,5’ – Hexachlorobiphenyl (PCB138)	469 ± 26 µg/L
2,2’,4,4’,5,5 – Hexachlorobiphenyl (PCB153)	486 ± 6 µg/L
2,2’,3,4,4’,5,5’ – Heptachlorobiphenyl (PCB180)	484 ± 7 µg/L

Nicotine
LGC1801

Batch: 004
Unit size: 0.6 mL

A batch of nicotine was obtained from a commercial supplier and purified by vacuum distillation to provide the bulk material of purity > 99 %. The purity was assessed by combining data from HPLC, GC, Karl Fischer and TGA.

This material is intended for use as a reference material in the calibration of instruments, and the quality control and validation of methods used to determine the presence and quantity of nicotine.

UKAS REFERENCE MATERIALS
4005

Certified value:	
Purity	99.57 ± 0.32 mass %

Fresh Water Materials

River water – anions
LGC6020

Batch: 002
Unit size: 250 mL

A supply of water was taken from Menethorpe Beck, Yorkshire, UK. A soluble copper salt solution was added (as a biocide) to provide a copper concentration of 2.7 mg/L. The levels of phosphate and fluoride were adjusted by spiking the base material with high purity salts to achieve the target concentrations. The solution was thoroughly mixed and filtered sequentially through 8 µm, 1.2 µm and 0.45 µm membrane filters and 250 mL aliquots were sub-sampled into tamper evident screw-cap amber glass bottles.

The primary intended use of this material is for the development, validation, or quality control of analytical methods for the determination of anions in river water.

UKAS REFERENCE MATERIALS
4005

Certified values:			
Chloride	33.1 ± 1.2 mg/L	Fluoride	0.273 ± 0.023 mg/L
Nitrate (as NO_3^-)	28.2 ± 1.2 mg/L	Sulfate (as SO_4^{2-})	82.8 ± 2.4 mg/L

Indicative value:	
Phosphate (as PO_4^{3-})	0.003 - 0.300 mg/L

River water – anions
LGC6025

Batch: 001
Unit size: 250 mL

A supply of water was taken from from Menethorpe Beck, Yorkshire, UK.The water was filtered sequentially through 8.0 µm and 0.2 µm membrane filters before the addition of a soluble copper salt solution (as a biocide) to provide a copper concentration of 1 mg/L. The levels of phosphate and fluoride were adjusted by spiking the base material with high purity salts to achieve the target concentrations.

The primary intended use of this material is for the development, validation, or quality control of analytical methods for the determination of anions in river water.

UKAS REFERENCE MATERIALS
4005

Certified values:			
Chloride	31.3 ± 1.3 mg/L	Fluoride	1.248 ± 0.074 mg/L
Nitrate(as NO_3^-)	38.0 ± 1.6 mg/L	Sulfate (as SO_4^{2-})	66.2 ± 1.8 mg/L

Indicative value:	
Phosphate (as PO_4^{3-})	0.08 - 1.61 mg/L

Miscellaneous Water Materials

Estuarine water trace metals LGC6016

Batch: 001
Unit size: 50 mL

Estuarine water was collected from the Severn Estuary, UK, offshore from a heavily industrialised area near Avonmouth. The water was filtered through a 0.45 µm membrane filter and then stabilised by the addition of concentrated nitric acid to achieve a pH of 2.

This material is intended for use in development, validation or quality control of analytical methods for the determination of metals in estuarine water.

4005

Certified values:			
Cadmium	101 ± 2 µg/kg	Manganese	976 ± 31 µg/kg
Copper	190 ± 4 µg/kg	Nickel	186 ± 3 µg/kg
Lead	196 ± 3 µg/kg		

Indicative values:			
Calcium	220 mg/L	Sodium	4700 mg/L
Magnesium	570 mg/L	Zinc	55 µg/L
Potassium	180 mg/L		

Landfill leachate – trace metals LGC6177

Batch: 001
Unit size: 50 mL

A supply of leachate originating from a landfill site in Loughborough, Leicestershire, UK was collected, initially filtered through a 0.7 µm membrane filter and then stabilised with the addition of concentrated nitic acid to provide a pH of 2. The solution was then filtered through a 0.45 µm membrane filter, thoroughly mixed.

This material is intended for use in development, validation or quality control of analytical methods for the determination of metals in landfill leachate. This material may also be applicable to other matrices where more closely matched reference materials are not available.

4005

Assessed values:			
Boron	9.8 ± 0.5 mg/L	Manganese	0.14 ± 0.02 mg/L
Calcium	74.8 ± 1.7 mg/L	Nickel	0.21 ± 0.02 mg/L
Chromium	0.18 ± 0.02 mg/L	Phosphorus	11.5 ± 1.5 mg/L
Iron	3.8 ± 0.2 mg/L	Potassium	780 ± 14 mg/L
Manganese	73.5 ± 2.7 mg/L	Sodium	1750 ± 29 mg/L

Sediment Materials

River sediment
LGC6187

Batch: 001
Unit size: 80 g

River sediment obtained from a monitoring station lagoon on the River Elbe close to the Czech-German border. The material was air-dried at 40 °C, and ground to a particle size of less than 100 µm. The material was sieved, homogenised, divided into 80 g sub-samples and packaged in amber glass bottles with screw caps. The bottled material was then radiation sterilised.

This material is intended for use in the development, validation or quality control of analytical methods for the determination of extractable metals in river sediment. The material may also be applicable to other matrices where more closely matched reference materials are not available.

4005

Certified value:			
Arsenic	24.0 ± 3.2 mg/kg	Mercury	1.4 ± 0.1 mg/kg
Cadmium	2.7 ± 0.3 mg/kg	Nickel	34.7 ± 1.7 mg/kg
Chromium	84.0 ± 9.4 mg/kg	Selenium	1.2 ± 0.2 mg/kg
Copper	83.6 ± 4.1 mg/kg	Tin	6.8 ± 1.8 mg/kg
Iron	23600 ± 1500 mg/kg	Vanadium	38.3 ± 6.5 mg/kg
Lead	77.2 ± 4.5 mg/kg	Zinc	439 ± 26 mg/kg
Manganese	1240 ± 60 mg/kg		

Indicative value:	
Weight loss on ignition	12 g/100 g

River sediment – PAHs
LGC6188

Batch: 001
Unit size: 30 g

A river sediment was taken from a monitoring station lagoon on the river Elbe close to the Czech- German border. The material was allowed to settle and coarse filtered on site to remove large particles then transported to a laboratory for preparation. The material was air-dried at 40 °C, manually crushed then ground in a ceramic ball-mill to a particle size of less than 100 µm. The material was sieved, homogenised, divided into 30 g sub-samples and packaged in amber glass bottles with screw caps. The bottled material was then radiation sterilised using a ^{60}Co source at a dosing rate of 25 kGy.

UKAS REFERENCE MATERIALS
4005

This material is intended for use in development, validation or quality control of analytical methods for the determination of polyaromatic hydrocarbons (PAHs) in sediments. The material may also be applicable to other matrices where more closely matched reference materials are not available.

Assessed values:	
Phenanthrene	0.74 ± 0.29 mg/kg
Anthracene	0.231 ± 0.081 mg/kg
Fluoranthene	1.52 ± 0.32 mg/kg
Pyrene	1.24 ± 0.50 mg/kg
Chrysene	0.63 ± 0.16 mg/kg
Benzo[*a*]anthracene	0.60 ± 0.19 mg/kg
Benzo[*b*]fluoranthene	0.68 ± 0.18 mg/kg
Benzo[*k*]fluoranthene	0.323 ± 0.084 mg/kg
Benzo[*a*]pyrene	0.51 ± 0.16 mg/kg
Dibenzo[*a,h*]anthracene	0.86 ± 0.023 mg/kg
Benzo[*g,h,i*]perylene	0.35 ± 0.12 mg/kg

Indicative values:			
Acenaphthylene	0.05 mg/kg	Naphthalene	0.2 mg/kg
Acenaphthene	0.03 mg/kg	Loss on drying	2.0 g/100g
Fluorene	0.05 mg/kg	Indeno[1,2,3-*cd*]pyrene	0.4 mg/kg

River sediment – extractable metals LGC6189

Batch: 001
Unit size: 30 g

A river sediment was taken from a monitoring station lagoon on the river Elbe, in the Czech Republic, close to the Czech-German border.The material was allowed to settle and coarse filtered on site to remove large particles then transported to a laboratory for preparation.The material was air-dried at 40 °C, manually crushed then ground in a ceramic ball-mill to a particle size of less than 100 µm. The material was sieved, homogenised, divided into 30 g sub-samples and packaged in amber glass bottles with screw caps. The bottled material was then radiation sterilised using a ^{60}Co source at a dosing rate of 25 kGy.

This material is intended for use as a reference material in the development, validation or quality control of analytical methods for the determination of extractable metals in sediments. The material may also be applicable to other matrices where more closely matched reference materials are not available.

Assessed values:			
Arsenic	26 ± 2 mg/kg	Molybdenum	1.2 ± 0.1 mg/kg
Cadmium	3.3 ± 0.5 mg/kg	Nickel	34 ± 3 mg/kg
Chromium	93 ± 8 mg/kg	Lead	87 ± 6 mg/kg
Copper	87 ± 8 mg/kg	Zinc	460 ± 30 mg/kg
Manganese	1120 ± 60 mg/kg		

Indicative values:			
Barium	280 mg/kg	Selenium	1.2 mg/kg

Information values:			
Loss on Drying	1.6 g / 100 g	Conductivity	1470 µS / cm
pH	7.1	Loss on Ignition	9.35 g / 100 g
SiO_2	50 %	MgO	1 %
Al_2O_3	10 %	P_2O_5	2 %
CaO	4 %	SO_3	1 %
Fe_2O_3	5 %	K_2O	2 %
Quartz SiO_2	Major	Kaolinite Clay	Small
Albite $NaAlSi_3O_8$	Minor	Muscovite Clay	Small
Calcite $CaCO_3$	Minor		

Sewage Sludge Materials

Sewage sludge—metals
ERM®- CC136

Batch: a
Unit size: 25 g

Aged sewage sludge collected from a disused sewage works site at Heathrow in London, UK. The material was dried and sterilised at 130 °C for 3 hours and ground to less than 250 µm particle size.

This material is intended for use as a reference material in the development, validation or quality control of analytical methods for the determination of extractable metals in sewage sludge. The material may also be applicable to other matrices where more closely matched reference materials are not available.

4005

Certified values: *Extractable Metal Content*			
Aluminium	15100 ± 5400 mg/kg	Magnesium	2820 ± 540 mg/kg
Barium	633 ± 195 mg/kg	Manganese	544 ± 32 mg/kg
Chromium	399 ± 32 mg/kg	Nickel	130 ± 10 mg/kg
Cobalt	23.2 ± 3.6 mg/kg	Potassium	2030 ± 844 mg/kg
Copper	464 ± 21 mg/kg	Sodium	397± 64 mg/kg
Iron	22200 ± 2780 mg/kg	Zinc	890 ± 140 mg/kg
Lead	341 ± 18 mg/kg		

Additional Information: *Total Metal Content*			
Aluminium	31100 mg/kg	Magnesium	4200 mg/kg
Arsenic	19 mg/kg	Manganese	600 mg/kg
Barium	910 mg/kg	Mercury	4 mg/kg
Beryllium	1.3 mg/kg	Molybdenum	14 mg/kg
Cadmium	39 mg/kg	Nickel	136 mg/kg
Calcium	37500 mg/kg	Potassium	8700 mg/kg
Chromium	400 mg/kg	Selenium	2 mg/kg
Cobalt	30 mg/kg	Sodium	3600 mg/kg
Copper	480 mg/kg	Titanium	2800 mg/kg
Iron	25900 mg/kg	Vanadium	73 mg/kg
Lead	330 mg/kg	Zinc	850 mg/kg
Lithium	23 mg/kg		

Additional Information: *Extractable Metal Content*			
Arsenic	21 mg/kg	Lithium	9 mg/kg
Beryllium	0.7 mg/kg	Molybdenum	12 mg/kg
Boron	23 mg/kg	Selenium	1 mg/kg
Cadmium	30 mg/kg	Titanium	168 mg/kg
Calcium	28800 mg/kg	Vanadium	42 mg/kg

Sewage sludge – extractable metals
LGC6181

Batch: 001
Unit size: 100 g

This material is a digested sewage sludge of mixed origin which was taken from a city water treatment plant immediately after discharge from a digestion tank. The material was air-dried at 40 °C, and ground to a particle size of less than 100 µm. The material was sieved, homogenised, divided into 100 g sub-samples and packaged in amber glass bottles with screw caps. The bottled material was then radiation sterilised.

4005

This material is intended for use in development, validation or quality control of analytical methods for the determination of extractable metals in sewage sludge. The material may also be applicable to other matrices where more closely matched reference materials are not available.

Certified values: *Extractable Metal Content*			
Arsenic	7.8 ± 0.9 mg/kg	Manganese	454 ± 23 mg/kg
Cadmium	5.8 ± 0.3 mg/kg	Mercury	4.9 ± 0.4 mg/kg
Chromium	78 ± 8 mg/kg	Nickel	45 ± 3 mg/kg
Copper	354 ± 18 mg/kg	Silver	55 ± 5 mg/kg
Iron	40300 ± 2300 mg/kg	Vanadium	20 ± 2 mg/kg
Lead	105 ± 8 mg/kg	Zinc	1100 ± 50 mg/kg

Indicative value: *Extractable Metal Content*	
Tin	20 mg/kg

Sewage sludge – PAHs
LGC6182

Batch: 001
Unit size: 30 g

Digested sewage sludge of mixed origin was taken from a city water treatment plant immediately after discharge from a digestion tank. The material was air-dried at 40 °C, manually crushed then ground in a ceramic ball-mill to a particle size of less than 100 µm. The material was sieved, homogenised, divided packaged in 30 g portions. The bottled material was then radiation sterilised.

4005

This material is intended for use in development, validation or quality control of analytical methods for the determination of PAHs in sewage sludge. The material may also be applicable to other matrices where more closely matched reference materials are not available.

Assessed values:	
Naphthalene	0.20 ± 0.13 mg/kg
Fluorene	0.159 ± 0.068 mg/kg
Anthracene	0.162 ± 0.067 mg/kg
Fluoranthene	1.35 ± 0.26 mg/kg
Pyrene	1.26 ± 0.43 mg/kg
Chrysene	0.76 ± 0.18 mg/kg
Benzo[*a*]anthracene	0.56 ± 0.21 mg/kg
Benzo[*b*]fluoranthene	0.71 ± 0.14 mg/kg
Benzo[*a*]pyrene	0.406 ±0.087 mg/kg
Indeno[1,2,3-*cd*]pyrene	0.36 ± 0.15 mg/kg
Benzo[*ghi*]perylene	0.46 ± 0.27 mg/kg

Indicative values:	
Acenaphthylene	0.4 mg/kg
Dibenzo(*a,h*)anthracene	0.09 mg/kg
Acenaphthene	0.09 mg/kg
Benzo[k]fluoranthene	0.3 mg/kg
Phenanthrene	0.8 mg/kg
Loss on drying	6.6 g/100g

Sewage sludge – PCBs
LGC6184

Batch: 001
Unit size: 30 g

Digested sewage sludge of mixed origin, taken from a city water treatment plant in the Czech Republic, immediately after discharge from a digestion tank. The material was air-dried at 40 °C, manually crushed then ground in a ceramic ball-mill to a particle size of less than 100 µm. The material was sieved, homogenised, and packaged in 30 g portions. The bottled material was then radiation sterilised using a ^{60}Co source at a dosing rate of 25 kGy.

4005

This material is intended for use in development, validation or quality control of analytical methods for the determination of polychlorinated biphenyls in sewage sludge. The material may also be applicable to other matrices where suitable reference materials are not available.

Certified values:			
PCB 101	37 ± 3 µg/kg	PCB 153	112 ± 8 µg/kg
PCB 118	17 ± 2 µg/kg		

Assessed values:			
PCB 28	28 ± 8 µg/kg	PCB 170	37 ± 5 µg/kg
PCB 52	14 ± 4 µg/kg	PCB 180	78 ± 10 µg/kg
PCB 138	77 ± 7 µg/kg	PCB 187	35 ± 5 µg/kg
PCB 149	63 ± 6 µg/kg	PCB 194	13 ± 3 µg/kg

Indicative values:			
PCB 31	18 µg/kg	PCB 110	26 µg/kg
PCB 77	3 µg/kg		

Contaminated brick works soil ERM®- CC135

Batch: a
Unit size: 50 g

This material is a contaminated soil that was obtained from a brickworks site in Hackney, London. A suitable quantity of soil was heat sterilised at 130 °C for 3 hours. This was then dried and ground to 100 µm. The sample was homogenised and 50 g units were sub-sampled into amber glass bottles with screw caps.

This material is intended for use as a reference material in the development, validation or quality control of analytical methods for the determination of extractable metals and total metals in soils. The material may also be applicable to other matrices where more closely matched
reference materials are not available.

UKAS REFERENCE MATERIALS
4005

Certified values: *Extractable metal content*			
Aluminium	22700 ± 4600 mg/kg	Potassium	5100 ± 920 mg/kg
Barium	134 ± 10 mg/kg	Magnesium	7000 ± 580 mg/kg
Beryllium	1.4 ± 0.4 mg/kg	Manganese	348 ± 18 mg/kg
Calcium	21900 ± 520 mg/kg	Sodium	362 ± 44 mg/kg
Cobalt	20 ± 4 mg/kg	Nickel	277 ± 13 mg/kg
Chromium	336 ± 28 mg/kg	Lead	391 ± 16 mg/kg
Copper	105 ± 5 mg/kg	Selenium	0.9 ± 0.3 mg/kg
Iron	40900 ± 2700 mg/kg	Vanadium	78 ± 11 mg/kg
Mercury	3.2 ± 0.4 mg/kg	Zinc	316 ± 41 mg/kg

Certified values: *Total metal content*			
Barium	305 ± 37 mg/kg	Magnesium	9400 ± 1200 mg/kg
Calcium	23400 ± 2900 mg/kg	Manganese	390 ± 40 mg/kg
Chromium	455 ± 59 mg/kg	Sodium	1700 ± 270 mg/kg
Copper	107 ± 5 mg/kg	Nickel	291 ± 22 mg/kg
Iron	47500 ± 4600 mg/kg	Lead	411 ± 26 mg/kg
Mercury	2.9 ± 0.6 mg/kg	Vanadium	139 ± 18 mg/kg
Potassium	16300 ± 2600 mg/kg	Zinc	345 ± 49 mg/kg

Additional material information: *Extractable metal content*	
Lithium	20 mg/kg
Molybdenum	20 mg/kg
Tin	35 mg/kg
Titanium	200 mg/kg

Additional material information: *Total metal content*	
Aluminium	50000 mg/kg
Beryllium	2 mg/kg
Cobalt	28 mg/kg
Lithium	54 mg/kg
Molybdenum	26 mg/kg
Tin	37 mg/kg
Titanium	3400 mg/kg
Selenium	1 mg/kg

Contaminated soil – PCBs and PAHs
LGC6115

Batch: 001
Unit size: 50 g

This material was blended from three soils sourced from the Czech Republic. The material was air-dried at 40 °C, manually crushed then ground in a ceramic ball-mill to a particle size of ≤ 200 µm. The material was sieved, homogenised, divided into 50 g sub-samples and packaged in amber glass bottles with screw caps. The bottled material was then radiation sterilised using ^{60}Co at a dose of 5-15 kGy.

UKAS REFERENCE MATERIALS
4005

This material is intended for use in the validation of methods for the determination of PCBs and PAHs in soil materials.

Certified values:			
PCB101	93 ± 7 µg/kg	Benzo[*a*]anthracene	36 ± 1 mg/kg
PCB118	116 ± 4 µg/kg	Benzo[*a*]pyrene	13 ± 0.02 mg/kg
Phenanthrene	178 ± 6 mg/kg	Benzo[*ghi*]perylene	0.33 ± 0.06 mg/kg
Fluoranthene	312 ± 7 mg/kg		

Assessed values			
PCB138	16 ± 5 µg/kg	PCB180	9.6 ± 6.1 µg/kg
PCB153	19 ± 7 µg/kg		

Indicative values:			
Acenaphthene	3 mg/kg	Al_2O_3	13 g/100 g
Acenaphthylene	1 mg/kg	CaO	1.9 g/100 g
Anthracene	3 mg/kg	Fe_2O_3	4.9 g/ 100 g
Benzo[*b*]fluoranthene	6 mg/kg	K_2O	3.8 g/100 g
Benzo[*k*]fluoranthene	3 mg/kg	MgO	2.3 g/100 g
Chrysene	20 mg/kg	MnO	0.1 g/100 g
Dibenzo[*ah*]anthracene	0.2 mg/kg	P_2O_5	1.1 g/100 g
Fluorene	50 mg/kg	SO_3	0.2 g/100 g
Indeno[123-*cd*]pyrene	0.4 mg/kg	SiO_2	55 g/100 g
Naphthalene	4 mg/kg	TiO_2	0.75 g/100 g
Pyrene	120 mg/kg	Quartz SiO_2	Major
Soil textural class (UK)	Sandy Loam	Albite $NaAlSi_3O_8$	Minor
Loss on drying	1.76 % w/w	Kaolinite Clay	Small
pH	6.8	Muscovite Clay	Small
Conductivity	149 µS / cm	Unidentified crystalline material	Small
Loss on ignition	5.0 g/ 100 g		

Contaminated clay loam soil – extractable metals, PAHs and inorganics
LGC6145

Batch: 001
Unit size: 50 g

This material was blended from two soils, sourced from the Czech Republic and one soil sourced from the UK. The material was air-dried at 40 °C, manually crushed then ground in a ceramic ball-mill to a particle size of ≤ 200 µm. The material was sieved, homogenised, divided into 50 g sub-samples and packaged in amber glass bottles with screw caps. The bottled material was then radiation sterilised using ^{60}Co at a dose of 5-15 kGy.

This material is intended for use in validating methods for the determination of metals in soil materials. The metal content of this material has been certified using CRC-ICP-MS techniques (following aqua-regia extraction according to ISO 11466) but is suitable for use with other appropriate analytical techniques for the determination of the quantity of metals. The material is also of use for validating methods for the determination of selected PAHs, water soluble sulfate and water soluble chloride in soil materials, where assessed values are given.

Certified values:			
Arsenic	38.7 ± 1.2 mg/kg	Nickel	39.0 ± 2.5 mg/kg
Cadmium	0.65 ± 0.07 mg/kg	Selenium	1.81 ± 0.13 mg/kg
Chromium	47.6 ± 1.8 mg/kg	Vanadium	53.9 ± 2.3 mg/kg
Copper	62.2 ± 3.6 mg/kg	Zinc	137 ± 6 mg/kg
Lead	45.1 ± 2.3 mg/kg		

Assessed values:	
Phenanthrene	325 ± 26 mg/kg
Chrysene	45 ± 9 mg/kg
Benzo[*b*]fluoranthene	12 ± 3 mg/kg
Indeno[1,2,3-*cd*] pyrene	0.97 ± 0.28 mg/kg
Water soluble chloride	65 ± 9 mg/kg
Water soluble sulfate	5.3 ± 0.7 g/L

Indicative values:			
Acenaphthene	1 mg/kg	Al_2O_3	21 g/100 g
Fluorene	100 mg/kg	CaO	0.8 g/100 g
Fluoranthene	600 mg/kg	Fe_2O_3	5.6 g/ 100 g
Pyrene	200 mg/kg	K_2O	3.0 g/100 g
Benzo[*a*]anthracene	60 mg/kg	MgO	1.7 g/100 g
Benzo[*k*]fluoranthene	6 mg/kg	SO_3	4.7 g/100 g
Benzo[*a*]pyrene	0.3 mg/kg	SiO_2	47 g/100 g
Dibenzo[*a,h*]anthracene	0.3 mg/kg	TiO_2	0.7 g/100 g
Benzo[***ghi***]perylene	0.7 mg/kg	Soil textural class (UK)	Clay Loam
Acenaphthylene	1 mg/kg	Loss on drying	2.7 %
Anthracene	5 mg/kg	pH	5.2
Naphthalene	4 mg/kg	Loss on ignition	4 %
Easily liberated cyanide	<20 mg/kg	Quartz SiO_2	Major
Total cyanide	600 mg/kg	Kaolinite Clay	Minor
Total sulfur	16 g/kg	Muscovite Clay	Minor
Unidentified crystalline material		Small	

Loamy sand soil 2 – total petroleum hydrocarbons LGCQC3013

Batch: 001
Unit size: 100 g

This material was prepared from a soil sample obtained from a contaminated electricity sub-station site in the UK. The TPH contamination is derived from cable insulating oil which had leaked into the soil. The soil was first dried in calibrated fan-assisted drying ovens at (30 ± 4) °C and then any large particles broken down using a pestle and mortar. The product was then milled and sieved to obtain a powder with a particle size of < 150 µm. The material was then homogenised by gentle rotation for 50 hours, and bottled into 100 g units in screw cap amber glass bottles.

This material is intended for use as a quality control material for analytical methods used in the investigation of soil for TPH contamination. The material may also be applicable to other similar matrices where more closely matched quality control materials are not available.

Indicative values: *Textural classification - loamy sand soil*			
Sand: 2.00 – 0.063 mm	87 %	Clay: < 0.002 mm	7 %
Silt: 0.063 – 0.002 mm	6 %		

Indicative value:	
TPH (C10 – C40)	4100 mg/kg

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