

ENVIRONMENT

Reference Materials Catalogue 2024



Environment

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Environment

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Environment

Ash Materials

Pulverised fuel ash LGC6180

Batch: 001
Unit size: 50 g

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



4005

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.

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

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 in 4 mL amber screw top vials.

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

Additional material data:	
$\delta^{13}\text{C}_{\text{VPDB-LSVEC}}$	-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.

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

Indicative values:	
$\delta^{13}\text{C}_{\text{VPDB-LSVEC}}$	
LGC1711	-42.22 ± 0.34 (‰)
LGC1712	-24.66 ± 0.24 (‰)
LGC1713	$+12.55 \pm 0.22$ (‰)

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. The material was bottled in 250 mL portions in tamper-evident screw cap amber glass bottles and stored at (5 ± 4) °C.

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.

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



4005

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. The material was bottled in 250 mL portions in tamper evident screw cap amber glass bottles and stored at (5 ± 4) °C.

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.

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



4005

**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.

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.



4005

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 ± 0.31 µg/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.

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 closely matched reference materials are not available.



4005

Certified values:			
Aluminium	196.1 µg/L	Manganese	49.9 µg/L
Antimony	5.21 µg/L	Molybdenum	4.62 µg/L
Arsenic	10.00 µg/L	Nickel	20.01 µg/L
Barium	115.7 µg/L	Selenium	10.21 µg/L
Beryllium	5.09 µg/L	Strontium	496 µg/L
Boron	1006 µg/L	Thallium	4.88 µg/L
Cadmium	5.09 µg/L	Uranium	4.95 µg/L
Chromium	49.9 µg/L	Vanadium	4.93 µg/L
Cobalt	4.87 µg/L	Zinc	613 µg/L
Copper	1995 µg/L	Calcium	8.53 µg/L
Iron	200.0 µg/L	Magnesium	1.026 µg/L
Lead	10.15 µg/L	Potassium	0.367 µg/L
Lithium	10.41 µg/L	Sodium	4.36 µg/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.



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	20.1 µg/L	Molybdenum	2.20 µg/L
Antimony	5.02 µg/L	Nickel	4.85 µg/L
Arsenic	4.98 µg/L	Selenium	5.13 µg/L
Barium	92.8 µg/L	Strontium	193.8 µg/L
Beryllium	2.05 µg/L	Thallium	4.98 µg/L
Boron	76.2 µg/L	Uranium	4.90 µg/L
Cadmium	0.970 µg/L	Vanadium	1.908 µg/L
Chromium	9.76 µg/L	Zinc	58.2 µg/L
Cobalt	4.66 µg/L	Calcium	79.6 mg/L
Copper	36.0 µg/L	Magnesium	13.30 mg/L
Lead	1.033 µg/L	Potassium	4.91 mg/L
Lithium	10.44 µg/L	Sodium	23.47 mg/L
Manganese	4.74 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 P₂O₅ 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.



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 P₂O₅ 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.



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 P₂O₅ 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.



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). The solution was divided into 1.2 mL portions sealed in amber glass ampoules.

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



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

**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 %. Sub-samples of approximately 0.6 mL were dispensed into amber glass ampoules and sealed under argon.

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. The purity was assessed by combining data from HPLC, GC, Karl Fischer and TGA.



4005

Certified value:

Purity	99.57 ± 0.32 mass %
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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.



4005

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.

Certified values:

Chloride	33.1 ± 1.2 mg/L	Fluoride	0.273 ± 0.023 mg/L
Nitrate	28.2 ± 1.2 mg/L	Sulfate	82.8 ± 2.4 mg/L

Indicative value:

Phosphate	0.003 - 0.300 mg/L (Range of inter-laboratory results)
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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 solution was thoroughly mixed and 250 mL aliquots were sub-sampled into tamper evident screw-cap amber glass bottles.



4005

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.

Certified values:

Chloride	31.3 ± 1.3 mg/L	Fluoride	1.248 ± 0.074 mg/L
Nitrate	38.0 ± 1.6 mg/L	Sulfate	66.2 ± 1.8 mg/L

Indicative values:

Phosphate	0.08-1.61 mg/L (Range of inter-laboratory results)
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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 nitric acid to provide a pH of 2. The solution was then filtered through a 0.45 µm membrane filter, thoroughly mixed, and sub-sampled in 50 mL portions into high density polyethylene bottles.

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.



4005

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.

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 ⁶⁰Co 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 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
Acenaphthene	0.03 mg/kg
Fluorene	0.05 mg/kg
Indeno[1,2,3-cd]pyrene	0.4 mg/kg
Naphthalene	0.2 mg/kg

Indicative value:	
Weight loss on drying	2.0 g/100 g

**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 ⁶⁰Co 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
Cadmium	3.3 ± 0.5 mg/kg
Chromium	93 ± 8 mg/kg
Copper	87 ± 8 mg/kg
Manganese	1120 ± 60 mg/kg
Molybdenum	1.2 ± 0.1 mg/kg
Nickel	34 ± 3 mg/kg
Lead	87 ± 6 mg/kg
Zinc	460 ± 30 mg/kg

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

Assessed values:

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		

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.

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.



4005

Certified values:

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

**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 into 30 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 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

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, divided into 30 g sub-samples and packaged in amber glass bottles with screw caps. The bottled material was then radiation sterilised using a ⁶⁰Co 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 more closely matched reference materials are not available.

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

Soil Materials

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.



4005

Certified values:

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

Additional material information:

Lithium	20 mg/kg
Molybdenum	20 mg/kg
Tin	35 mg/kg
Titanium	200 mg/kg

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 $\leq 200 \mu\text{m}$. 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.



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	Benzoanthracene	36 ± 1 mg/kg
PCB118	116 ± 4 µg/kg	Benzopyrene	13 ± 0.02 mg/kg
Phenanthrene	178 ± 6 mg/kg	Benzoperylene	0.33 ± 0.06 mg/kg
Fluoranthene	312 ± 7 mg/kg		

**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 $\leq 200 \mu\text{m}$. 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.



4005

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: Extractable Metal Content			
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

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 $< 150 \mu\text{m}$. 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:	
<i>Textural classification - loamy sand soil</i>	
Sand: 2.00 – 0.063 mm	87 %
Silt: 0.063 – 0.002 mm	6 %
Clay: < 0.002 mm	7 %

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



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