LGC Science and Innovation Division

LGC-produced Reference Materials Catalogue

June 2016

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Disclaimer

While every reasonable precaution has been taken in the preparation of this document, the author does not assume responsibility for errors or omissions in the information contained herein.

Please contact LGC Standards for more information before purchase.

Introduction

LGC's Science and Innovation Division acts as the UK's Designated Measurement Institute for chemical and bio-measurement, and has a long history in the development and validation of analytical methods and the production of reference materials.

Many of the analytical methods used to characterise the reference materials are accredited to ISO/IEC 17025 (Requirements for the competency of testing and calibration laboratories) and have been verified through participation in key comparison studies organised by the Consultative Committee for the Amount of Substance (CCQM) of the International Weights and Measures Organisation (BIPM). The reference material production team is accredited to ISO Guide 34 (General Requirements for the competence of reference materials producers) for a wide scope of materials.

LGC is a founder member of the European Reference Material (ERM®) co-operation established in 2004, along with the EU's Institute for Reference Materials and Measurement (IRMM) and Germany's Bundesanstalt für Materialforschung und Prüfung (BAM). ERM® members are committed to using the most advanced principles for the production of certified reference materials; providing certified values with clearly defined and stated traceability; and providing transparency of their approaches for the production of certified reference materials. Details of the ERM® concept, policy and guidelines can be found on the ERM website www.erm-crm.org.

In its role as the NMI, LGC serves on the International Organisation for Standardisation (ISO) Committee for Reference Materials (REMCO), which aims to carry out and encourage a broad international effort for the harmonization, production and application of certified reference materials (CRMs).

Full details of LGC's accreditation schedule can be found on the UKAS website (www.ukas.com).

To purchase any of the reference materials listed and described in this catalogue, please contact LGC Standards (www.lgcstandards.com).

ERM European Reference Materials

UKAS REFERENCE MATERIALS 4005

LGC Limited | Queens Road | Teddington | Middlesex | TW11 0LY | UK
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Melting Point Materials

Code	Batch	Description	Unit Size
ERM-FC021 4005 0423	**a**	**Carbazole** A batch of commercial carbazole was purified by recrystallisation and vacuum sublimation, then ground, homogenised and dried. This material is intended for use in checking and calibrating apparatus used for the determination of melting points of samples in glass capillary tubes. **Certified Value** Liquefaction Point..... 245.41 ± 0.29 ℃	**0.25 g**
ERM-FC022 4005 0423	**a**	**2-Chloroanthraquinone** A batch of commercial 2-chloroanthraquinone was purified by recrystallisation, then ground, homogenised and dried. This material is intended for use in checking and calibrating apparatus used for the determination of melting points of samples in glass capillary tubes. **Certified Value** Liquefaction Point..... 209.73 ± 0.24 ℃	**0.25 g**
ERM-FC023 4005 0423	**a**	**Anisic Acid** A batch of commercial anisic acid was ground, homogenised and dried. This material is intended for use in checking and calibrating apparatus used for the determination of melting points of samples in glass capillary tubes. **Certified Value** Liquefaction Point..... 183.50 ± 0.31 ℃	**0.25 g**

Code	Batch	Description	Unit Size
ERM-FC024  4005  0423	**a**	**Diphenylacetic Acid** A batch of commercial diphenylacetic acid was ground, homogenised and dried. This material is intended for use in checking and calibrating apparatus used for the determination of melting points of samples in glass capillary tubes. **Certified Value** Liquefaction Point..... 147.26 ± 0.31 ℃	**0.25 g**
ERM-FC025  4005  0423	**a**	**Benzoic Acid** A batch of commercial benzoic acid was purified by fractional crystallisation, then ground, homogenised and dried. This material is intended for use in checking and calibrating apparatus used for the determination of melting points of samples in glass capillary tubes. **Certified Value** Liquefaction Point..... 122.36 ± 0.26 ℃	**0.25 g**
ERM-FC026  4005  0423	**a**	**Acetanilide** A batch of commercial acetanilide was ground, homogenised and dried. This material is intended for use in checking and calibrating apparatus used for the determination of melting points of samples in glass capillary tubes. **Certified Value** Liquefaction Point..... 114.19 ± 0.28 ℃	**0.25 g**

Code	Batch	Description	Unit Size
ERM-FC027 4005 0423	**a**	**Benzil** A batch of commercial benzil was ground, homogenised and dried. This material is intended for use in checking and calibrating apparatus used for the determination of melting points of samples in glass capillary tubes. **Certified Value** Liquefaction Point.....94.90 ± 0.24 ℃	**0.25 g**
ERM-FC028 4005 0423	**a**	**Naphthalene** A batch of commercial naphthalene was ground, homogenised and dried. This material is intended for use in checking and calibrating apparatus used for the determination of melting points of samples in glass capillary tubes. **Certified Value** Liquefaction Point.....80.34 ± 0.22 ℃	**0.25 g**
ERM-FC029 4005 0423	**a**	**4-Nitrotoluene** A batch of commercial 4-nitrotoluene was purified by fractional crystallisation, then ground, homogenised and dried. This material is intended for use in checking and calibrating apparatus used for the determination of melting points of samples in glass capillary tubes. **Certified Value** Liquefaction Point.....51.66 ± 0.18 ℃	**0.25 g**
ERM-FC030 4005 0423	**a**	**Phenyl Salicylate** A commercial supply of phenyl salicylate was obtained and the purity of the material was assessed by High Performance Liquid Chromatography. This material is intended for use in checking and calibrating apparatus used for the determination of melting points of samples in glass capillary tubes. **Certified Value** Liquefaction Point.....41.82 ± 0.30 ℃	**0.25 g**

Enthalpy of Fusion Materials

Code	*Batch*	*Description*	*Unit Size*
LGC2601	**2**	**Indium** A suitable supply of pure material was obtained. Using adiabatic calorimetry, the measured mole fraction of purity was 99.99993 mol % This material is intended for the calibration of differential scanning calorimeters and similar instruments. **Certified Values** Enthalpy of Fusion..... 3.295 ± 0.010 kJ/mol Melting Temperature ..... 156.60 ± 0.03 ℃	**0.5 g**
LGC2603	**1**	**Naphthalene** A suitable supply of pure material was obtained and purified by zone refining. This material is intended for the calibration of differential scanning calorimeters and similar instruments. **Certified Values** Enthalpy of Fusion..... 18.923 ± 0.083 kJ/mol Melting Temperature ..... 80.25 ± 0.03 °C	**0.5 g**
LGC2604	**2**	**Benzil** The bulk material was purified by repeated fractional freezing from the melt. This material is intended for the calibration of differential scanning calorimeters and similar instruments. **Certified Values** Enthalpy of Fusion..... 23.26 ± 0.10 kJ/mol Melting Temperature ..... 94.85 ± 0.02 °C	**0.5 g**
LGC2605	**5**	**Acetanilide** A suitable supply of pure material was obtained. Using differential scanning calorimetry (DSC) and adiabatic calorimetry the measured mole fraction of purity was 99.98 % and 99.996 % respectively. This material is intended for the calibration of differential scanning calorimeters and similar instruments. **Certified Values** Enthalpy of Fusion..... 21.793 ± 0.085 kJ/mol Melting Temperature ..... 114.34 ± 0.02 ℃	**0.5 g**
LGC2606	**2**	**Benzoic Acid** The bulk material was purified by repeated fractional freezing from the melt. This material is intended for the calibration of differential scanning calorimeters and similar instruments. **Certified Values** Enthalpy of Fusion..... 17.98 ± 0.04 kJ/mol Melting Temperature ..... 122.35 ± 0.03 ℃	**0.5 g**
LGC2607	**6**	**Diphenylacetic Acid** A suitable supply of pure material was obtained. The purity of the material was assessed by adiabatic calorimetry; the measured mole fraction was 99.98%. This material is intended for the calibration of differential scanning calorimeters and similar instruments. **Certified Values** Enthalpy of Fusion..... 31.16 ± 0.13 kJ/mol Melting Temperature ..... 147.19 ± 0.03 ℃	**0.5 g**

Code	Batch	Description	Unit Size
LGC2608	**1**	**Lead** A suitable supply of pure material was obtained. The purity of the material was assessed by adiabatic calorimetry; the measured mole fraction was 99.9995%. This material is intended for the calibration of differential scanning calorimeters and similar instruments. **Certified Values** Enthalpy of Fusion..... 4.765 ± 0.012 kJ/mol Melting Temperature ..... 327.47 ± 0.02 ℃	**0.5 g**
LGC2609	**1**	**Tin** A suitable supply of pure material was obtained. The purity of the material was assessed by adiabatic calorimetry; the measured mole fraction was 99.9995%. This material is intended for the calibration of differential scanning calorimeters and similar instruments. **Certified Values** Enthalpy of Fusion..... 7.187 ± 0.011 kJ/mol Melting Temperature ..... 231.92 ± 0.02 ℃	**0.5 g**
LGC2610	**1**	**Biphenyl** A suitable supply of biphenyl was obtained and purified by repeated fractional freezing from the melt. The purity of the material was assessed by Adiabatic calorimetry; the measured mole fraction was 99.992%. This material is intended for the calibration of differential scanning calorimeters and similar instruments. **Certified Values** Enthalpy of Fusion..... 18.60 ± 0.11 kJ/mol Melting Temperature ..... 68.93 ± 0.02 °C	**0.5 g**
LGC2611	**1**	**Zinc** A suitable supply of pure material was obtained. The purity of the material was assessed by Adiabatic calorimetry; the measured mole fraction was 99.9998%. This material is intended for the calibration of differential scanning calorimeters and similar instruments. **Certified Values** Enthalpy of Fusion..... 7.103 ± 0.034 kJ/mol Melting Temperature ..... 419.53 ± 0.02 ℃	**0.5 g**
LGC2612	**1**	**Aluminium** A suitable supply of pure material was obtained. The purity of the material was assessed by Adiabatic calorimetry; the measured mole fraction was 99.9995%. This material is intended for the calibration of differential scanning calorimeters and similar instruments. **Certified Values** Enthalpy of Fusion..... 10.827 ± 0.052 kJ/mol Melting Temperature ..... 660.33 ± 0.05 ℃	**0.5 g**
LGC2613	**1**	**Phenyl Salicylate** A commercial supply of phenyl salicylate was obtained and purified by fractional crystallisation. The purity of the material was assessed by Adiabatic calorimetry; the measured mole fraction was 99.994%. This material is intended for the calibration of differential scanning calorimeters and similar instruments. **Certified Values** Enthalpy of Fusion..... 19.18 ± 0.08 kJ/mol Melting Temperature ..... 41.79 ± 0.03 °C	**0.5 g**

Purity Materials

Code	Batch	Description	Unit Size
ERM-AC021 4005	**a**	**Sirolimus** This material was produced from a batch of sirolimus donated by the supplier. It was dispensed into 0.1 g portions. The purity was assessed by combining data from HPLC-UV, Karl Fischer and TGA. This material is intended for use in the calibration of instruments, quality control and the validation of methods to determine the immunosuppressant drug sirolimus. It can also be used in the training and evaluation of staff. **Certified Value** Purity..... 98.89 ± 0.64 mass %	**0.1 g**
ERM-AC200 4005	**a**	**Digoxin** A batch of digoxin was obtained from a commercial supplier of reagents. The purity was assessed by combining data from HPLC-UV, Karl Fischer, ICP-OES and GC/MS. This material is intended for use in the validation and calibration and monitoring of methods to determine digoxin content. It can be used in the training and evaluation of staff. **Certified Value** Purity..... 98.0 ± 0.5 mass %	**0.5 g**
ERM-AC301 4005	**a**	**Butylated Hydroxyanisole (BHA)** A batch of butylated hydroxyanisole was obtained from a commercial supplier of chemical reagents. The purity was assessed by combining data from HPLC-UV, DSC and GC. This material is primarily intended for use as a calibration standard in methods of analysis for BHA in foodstuffs and other similar matrices. **Certified Value** Purity..... 99.2 ± 0.6 mass %	**0.5 g**
ERM-AC303 4005	**a**	**Leucomalachite Green** A batch of leucomalachite green was obtained from a commercial supplier of chemical reagents. The purity of the material was determined by HPLC-UV. The primary use of this reference material is for the calibration of methods for the determination of leucomalachite green in fish and other similar matrices. **Certified Value** Purity..... 98.8 ± 0.8 mass %	**0.1 g**
ERM-AC316 4005	**a**	**Solvent Yellow 124 (SY 124)** A batch of Solvent Yellow 124 was obtained from a commercial source. The purity of the material was determined by HPLC-UV and GC. This material is intended for use as an analytical standard for the determination of SY124 in fuel. **Certified Value** Purity..... 95.0 ± 1.2 mass %	**0.2 g**
ERM-AC802 4005	**b**	**Nicotine** A batch of nicotine of nominal purity > 99 % was obtained from a commercial supplier. The purity was assessed by combining data from HPLC, Karl Fischer, GC and NMR. This material is intended for use in checking the analytical procedures applied in the analysis of tobacco smoke condensate and of pesticide residues and formulations. **Certified Value** Purity..... 99.7 ± 0.3 mass %	**0.6 mL**

Code	Batch	Description	Unit Size
ERM-AC820  4005	**a**	**PCB 77** A batch of PCB 77 was obtained from a commercial supplier. This material is primarily intended as a calibration standard in methods of analysis of PCB 77 in environmental and other relevant matrices. **Certified Value** Purity..... 99.8 + 0.2/- 0.3 mass %	**0.02 g**
ERM-AC821  4005	**a**	**PCB 126** A batch of PCB 126 was obtained from a commercial supplier. This material is primarily intended as a calibration standard in methods of analysis of PCB 126 in environmental and other relevant matrices. **Certified Value** Purity..... 98.9 ± 0.3 mass %	**0.02 g**
ERM-AC822  4005	**a**	**PCB 169** A batch of PCB 169 was obtained from a commercial supplier. This material is primarily intended as a calibration standard in methods of analysis of PCB 169 in environmental and other relevant matrices. **Certified Value** Purity..... 99.4 + 0.6/- 1.3 mass %	**0.02 g**
ERM-AC823  4005	**a**	**PCBs in Iso-octane** This material is intended for method validation purposes and for checking instrument calibration for the measurement of polychlorinated biphenyls. **Certified Values** PCB 28..... 703 ± 15 µg/kg PCB 52..... 706 ± 7 µg/kg PCB 101..... .696 ± 7 µg/kg PCB 118..... 712 ± 9 µg/kg PCB 138 .....678 ± 37 µg/kg PCB 153 .....702 ± 8 µg/kg PCB 180 .....700 ± 9 µg/kg **Indicative Values** PCB 31.....697 µg/kg PCB 77.....697 µg/kg PCB 110.....690 µg/kg PCB 149.....695 µg/kg PCB 163 .....689 µg/kg PCB 170 .....693 µg/kg PCB 187 .....693 µg/kg PCB 194 .....693 µg/kg	**1.2 mL**
LGC1110  4005	**1**	***p,p'*-DDE** A batch of *p,p'*-DDE was obtained from a commercial supplier, ground and dried under vacuum. This material is intended for use in the preparation of solutions for the calibration of analytical instruments used in pesticide residue and formulation analysis. **Certified Value** Purity..... 99.6 ± 0.4 mass %	**0.25 g**

Code	Batch	Description	Unit Size
LGC1205	**1**	**Malathion** A batch of malathion was dried at ambient temperature under vacuum. This material is intended for use as a calibration standard in methods of analysis for malathion in food, environmental and other relevant matrices. **Certified Value** Purity..... 99.4 ± 0.6 mass %	**0.25 g**
LGC1706  4005	**1**	**Malachite Green Oxalate** A batch of malachite green oxalate was purified by supercritical fluid extraction. The purified material was homogenised by tumbling and rolling on a laboratory mill. This material is intended for use as an analytical standard for the determination of malachite green oxalate in foodstuffs, especially fish. **Assessed Value** Purity..... 94.2 ± 1.4 mass %	**0.25 g**
LGC7300  4005	**1**	**Butylated Hydroxytoluene (BHT)** A batch of butylated hydroxytoluene, obtained from a commercial supplier of chemical reagents, was ground, mixed and dispensed. This material is intended for use as a calibration standard in methods of analysis for BHT in foodstuffs and other relevant matrices. **Certified Value** Purity..... 99.8 + 0.2/- 1.4 mass %	**0.5 g**
LGC7302  4005	**1**	**Saccharin** A batch of saccharin, obtained from a commercial supplier of chemical reagents, was ground, mixed and dispensed. This material is intended for use as a calibration standard in methods of analysis for saccharin in foodstuffs, beverages and other relevant matrices. **Certified Value** Purity..... 99.6 + 0.4/- 0.6 mass %	**0.5 g**
LGC7305	**1**	**Potassium Sorbate** A batch of potassium sorbate, obtained from a commercial supplier of chemical reagents, was ground, mixed, dried over P_2O_5 and dispensed. This material is intended for use as a calibration standard in methods of analysis for potassium sorbate in foodstuffs and other relevant matrices. **Certified Value** Purity..... 99.8 ± 1.6 mass %	**0.5 g**
LGC7330	**1**	**Selenomethionine Enriched with ^{76}Se** A quantity of ^{76}Se-enriched selenomethionine was prepared from ^{76}Se-enriched selenium obtained from a commercial supplier. The primary use of this material is as a spike material for the determination of selenomethionine by species-specific isotope dilution with HPLC-ICP-MS, in combination with a standard of selenomethionine with natural isotopic composition. **Certified Value** Purity..... 99.8 ± 1.6 mass %	**0.01 g**

Elemental Analysis Materials

Code	*Batch*	*Description*	*Unit Size*
LGC4001	**1**	**Dibenzothiophene** A supply of dibenzothiophene of adequate purity was obtained, from which aliquots were sub-sampled and sealed in vials. This material is a micro-analytical standard intended for use in checking the performance of elemental analysers. **Certified Value** Sulfur.....17.6 ± 0.4 % m/m	**0.5 g**
LGC4002	**1**	**Acetanilide** Acetanilide was purified by repeated fractional recrystallisation from the melt. The resulting product was ground, sieved, tumbled and rolled on a laboratory mill to homogenise. This material is intended for use in the calibration of instruments used in elemental analysis. **Certified Values** Carbon .....71.09 % m/m Hydrogen.....6.71 % m/m Nitrogen.....10.36 % m/m	**1 g**
LGC4003	**1**	**Benzoic Acid** Benzoic acid was purified by repeated fractional recrystallisation from the melt. The resulting product was ground, sieved, tumbled and rolled on a laboratory mill to homogenise. This material is intended for use in the calibration of instruments used in elemental analysis. The theoretical composition has been used as the certified value. **Certified Value** Oxygen.....26.20 % m/m	**1 g**
LGC4008	**1**	**4-Bromobenzoic Acid** Pure 4-bromobenzoic acid was ground, sieved, tumbled and rolled on a laboratory mill to homogenise. This material is intended for use in the calibration of instruments used in elemental analysis. The theoretical composition has been used as the certified value. **Certified Value** Bromine.....39.75 % m/m	**1 g**
LGC4009	**1**	**2-Iodobenzoic Acid** Pure 2-iodobenzoic acid was ground, sieved, tumbled and rolled on a laboratory mill to homogenise. This material is intended for use in the calibration of instruments used in elemental analysis. The theoretical composition has been used as the certified value. **Certified Value** Iodine .....51.17 % m/m	**1 g**

Optical Materials

<table>
<tr><th>Code</th><th>Batch</th><th>Description</th><th>Unit Size</th></tr>
<tr><td>ERM-FB012
 
4005</td><td>a</td><td>IR Wavelength Standard
This wavelength standard is intended for use in the verification and calibration of infra-red spectrometers within the range of spectral bandwidths quoted.

Certified Values
True Peak Position | Shifts of Wavelength by Resolution
Spectral Bandwidth 0.5 cm^{-1} | Spectral Bandwidth 2 cm^{-1} | Spectral Bandwidth 4 cm^{-1}
3026.0 ± 0.4 cm^{-1} | 0.00 ± 0.1 cm^{-1} | 0.05 ± 0.1 cm^{-1}
1601.1 ± 0.4 cm^{-1} | 0.05 ± 0.1 cm^{-1} | 0.1 ± 0.1 cm^{-1}
1028.8 ± 0.4 cm^{-1} | 0.1 ± 0.1 cm^{-1} | 0.1 ± 0.1 cm^{-1}
698.0 ± 0.4 cm^{-1} | 0.1 ± 0.1 cm^{-1} | 0.3 ± 0.1 cm^{-1}</td><td>1 mL</td></tr>
<tr><td>ERM-FB020
 
4005</td><td>a</td><td>UV-Visible Wavelength Standard for HPLC Detectors
This material consists of a high purity solution of holmium and neodymium oxide in dilute perchloric acid.

This material is intended as a standard for use in the calibration of the wavelength scale of ultraviolet-visible HPLC detectors.

Certified Values
Wavelength Values (nm)
Spectral Bandwidth | 1 nm | 4 nm | 7 nm | 10 nm
Peak Number 1 | 241.2 ± 0.2 | 241.1 ± 0.3 | 241.0 ± 0.3 | 241.1 ± 0.3
Peak Number 2 | 287.2 ± 0.2 | 287.8 ± 0.3 | 288.4 ± 0.3 | 287.5 ± 0.3
Peak Number 3 | 333.5 ± 0.2 | 333.2 ± 0.3 | 332.9 ± 0.3 | 332.8 ± 0.3
Peak Number 4 | 416.3 ± 0.2 | 417.2 ± 0.3 | 417.4 ± 0.3 | 417.5 ± 0.3
Peak Number 5 | 485.3 ± 0.2 | 485.3 ± 0.3 | 485.1 ± 0.3 | 484.2 ± 0.3
Peak Number 6 | 575.1 ± 0.2 | 575.3 ± 0.3 | 575.8 ± 0.3 | 576.2 ± 0.3
Peak Number 7 | 794.1 ± 0.2 | 794.4 ± 0.3 | 795.9 ± 0.3 | 797.2 ± 0.3</td><td>3 mL</td></tr>
</table>

Flash Point Materials

Code	Batch	Description	Unit Size
ERM-FC032 4005	**a**	**n-Nonane** A supply of n-nonane, of nominally 99 % purity, was obtained from a commercial supplier. This material is intended for use in validation work, or in quality control procedures, for the determination of non-equilibrium flashpoint determined by the Abel closed cup method as described in the Institute of Petroleum Standard IP170/95, and also published as British Standard BS2000:Part 170: 1995. **Certified Value** Non-equilibrium Flashpoint .....32.5 ± 0.5 ℃	**100 mL**
ERM-FC033 4005	**a**	**n-Decane** A supply of n-decane, of nominally 99 % purity, was obtained from a commercial supplier. This material is intended for use in validation work, or in quality control procedures, for the determination of non-equilibrium flashpoint determined by the Abel closed cup method as described in the Institute of Petroleum Standard IP170/95, and also published as British Standard BS2000:Part 170: 1995. **Certified Value** Non-equilibrium Flashpoint .....50.0 ± 0.9 ℃	**100 mL**

Forensic Alcohol Materials

Code	Batch	Description	Unit Size
ERM-AC401 4005 0423	**g**	**Aqueous Ethanol – 80 mg/100 mL** This material, produced by LGC, is a solution of ethanol in water at a nominal concentration of 80 mg/100 mL. This material is primarily intended for use as a reference material for the calibration and validation of methods for the determination of ethanol in biological fluids. **Certified Value** Ethanol Content.....79.9 ± 0.6 mg/100 mL	**25 mL**
ERM-AC402 4005 0423	**b**	**Aqueous Ethanol – 107 mg/100 mL** This material, produced by LGC, is a solution of ethanol in water at a nominal concentration of 107 mg/100 mL. This material is primarily intended for use as a reference material for the calibration and validation of methods for the determination of ethanol in biological fluids. **Certified Value** Ethanol Content.....106.5 ± 0.6 mg/100 mL	**25 mL**
ERM-AC403 4005 0423	**d**	**Aqueous Ethanol – 200 mg/100 mL** This material, produced by LGC, is a solution of ethanol in water at a nominal concentration of 200 mg/100 mL. This material is primarily intended for use as a reference material for the calibration and validation of methods for the determination of ethanol in biological fluids. **Certified Value** Ethanol Content.....199.6 ± 0.7 mg/100 mL	**25 mL**
ERM-AC409 4005 0423	**b**	**Aqueous Ethanol – 20 mg/100 mL** This ERM®, produced by LGC, is a solution of ethanol in water at a nominal concentration of 20 mg/100 mL. This material is primarily intended for use as a reference material for the calibration and validation of methods for the determination of ethanol in biological fluids. **Certified Value** Ethanol Content.....20.1 ± 0.6 mg/100 mL	**50 mL**

Code	Batch	Description	Unit Size
ERM-AC510  4005  0423	**a**	**Aqueous Ethanol – 50 mg/100 mL** This material, produced by LGC is a solution of ethanol in water at a nominal concentration of 50 mg/100 mL. This material is primarily intended for use as a reference material for the calibration and validation of methods for the determination of ethanol in biological fluids. **Certified Value** Ethanol Content.....49.6 ± 0.6 mg/100 mL	**25 mL**
ERM-AC511  4005  0423	**a**	**Aqueous Ethanol – 67 mg/100 mL** This material, produced by LGC is a solution of ethanol in water at a nominal concentration of 67 mg/100 mL. This material is primarily intended for use as a reference material for the calibration and validation of methods for the determination of ethanol in biological fluids. **Certified Value** Ethanol Content.....66.9 ± 0.6 mg/100 mL	**25 mL**

ENVIRONMENTAL MATRIX MATERIALS

Code	Batch	Description	Unit Size
		DRINKING WATER MATERIALS	
ERM-CA011 4005	**c**	**Hard Drinking Water UK – Metals** Hard drinking water was sourced from Tamworth (Staffordshire, UK) potable mains supply. The water was filtered through a 0.2µm in-line filter and acidified to approximately 0.1% nitric acid. This material is intended for use in development, validation or quality control of analytical methods for the determination of elements in hard drinking water. **Certified Values** Aluminium ..... 199.7 ± 7.5 µg/L Antimony ..... 5.60 ± 0.27 µg/L Arsenic ..... 10.25 ± 0.41 µg/L Barium ..... 117.0 ± 3.8 µg/L Beryllium ..... 5.20 ± 0.21 µg/L Boron ..... 993 ± 48 µg/L Cadmium ..... 5.31 ± 0.23 µg/L Calcium ..... 81.0 ± 1.3 mg/L Chromium ..... 49.3 ± 1.9 µg/L Cobalt ..... 5.25 ± 0.21 µg/L Copper ..... 1963 ± 62 µg/L Iron ..... 198.3 ± 5.1 µg/L Lead ..... 10.01 ± 0.17 µg/L Magnesium ..... 13.62 ± 0.26 mg/L Manganese ..... 49.1 ± 1.6 µg/L Molybdenum ..... 5.32 ± 0.31 µg/L Nickel ..... 19.49 ± 0.88 µg/L Potassium ..... 5.01 ± 0.12 mg/L Selenium ..... 11.13 ± 0.47 µg/L Sodium ..... 24.47 ± 0.53 mg/L Strontium ..... 508 ± 26 µg/L Vanadium ..... 5.41 ± 0.33 µg/L Zinc ..... 605 ± 17 µg/L	**250 mL**
ERM-CA015 4005	**a**	**Hard Drinking Water UK – Anions** A supply of tap water (Teddington, UK) was collected, and copper sulfate was added as a biocide at a final concentration of 1 mg/L (as copper). The water was then filtered through 1 µm cellulose filters. The base levels of the analytes were measured and high purity salts were added gravimetrically to achieve anion concentrations in the water approximating to the maximum permissible levels specified in EU/UK drinking water regulations (EC directive 98/83/EC). This material is intended for use in validating methods and for confirming instrument calibration for anions in drinking water. **Certified Values** Chloride ..... 247 ± 8 mg/L Fluoride ..... 1.3 ± 0.1 mg/L Nitrate ..... 45 ± 3 mg/L Sulfate ..... 247 ± 7 mg/L **Indicative Value** Ammonium ..... 0.44 mg/L	**250 mL**
ERM-CA016 4005	**a**	**Soft Drinking Water UK – Anions** A supply of tap water (Plymouth, UK) was collected, and copper sulfate was added as a biocide at a final concentration of 1 mg/L (as copper). The water was then filtered through 1 µm cellulose filters. The base levels of the analytes were measured and high purity salts were added gravimetrically to achieve anion concentrations in the water approximating to the maximum permissible levels specified in EU/UK drinking water regulations (EC directive 98/83/EC). This material is intended for use in validating methods and for confirming instrument calibration for anions in drinking water. **Certified Values** Chloride ..... 250 ± 7 mg/L Fluoride ..... 1.5 ± 0.1 mg/L Nitrate ..... 48 ± 3 mg/L Sulfate ..... 254 ± 10 mg/L **Indicative Value** Ammonium ..... 0.48 mg/L	**250 mL**

Code	Batch	Description	Unit Size
ERM-CA022 4005	**a**	**Soft Drinking Water UK – Metals** Soft drinking water was sourced from the Bury (Lancashire, UK) potable mains supply. This material is intended for use in development, validation or quality control of analytical methods for the determination of metals in soft drinking water. **Certified Values** Aluminium ..... 204 ± 10 µg/L Arsenic ..... 10.3 ± 1.3 µg/L Barium ..... 127 ± 13 µg/L Calcium ..... 7.33 ± 0.25 mg/L Cadmium ..... 5.26 ± 0.21 µg/L Chromium ..... 50.8 ± 2.7 µg/L Copper ..... 2100 ± 70 µg/L Iron ..... 201 ± 2 µg/L Lead ..... 26.0 ± 0.9 µg/L Magnesium ..... 1.01 ± 0.04 mg/L Manganese ..... 52.5 ± 3.9 µg/L Nickel ..... 20.5 ± 1.6 µg/L Sodium ..... 5.84 ± 0.14 mg/L Zinc ..... 628 ± 4 µg/L	**250 mL**
FRESH WATER MATERIALS			
LGC6019 4005	**1**	**River Water – Trace Metals** Collected from the River Thames downstream of Henley-on-Thames at Aston, U.K. Filtered at 0.7 µm and then at 0.45 µm. Stabilised at pH 2 by the addition of concentrated HNO_3. This material is intended for use in development, validation or quality control of analytical methods for the determination of elements in river waters. **Certified Values** Aluminium ..... 73 ± 13 µg/L Calcium ..... 109 ± 3 mg/L Cadmium ..... 0.11 ± 0.02 µg/L Chromium ..... 0.78 ± 0.20 µg/L Copper ..... 15.4 ± 1.5 µg/L Lead ..... 5.2 ± 0.3 µg/L Potassium ..... 4.78 ± 0.12 mg/L Magnesium ..... 4.62 ± 0.12 mg/L Sodium ..... 24.7 ± 0.5 mg/L Zinc ..... 59.7 ± 2.5 µg/ L	**250 mL**
LGC6020 4005	**2**	**River Water – Anions** Collected 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. This material is intended for use in development, validation or quality control of analytical methods for the determination of anions in river waters. **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) ..... 82.8 ± 2.4 mg/L **Additional Value** Phosphate (as PO_4) 0.003 – 0.300 mg/L (Range of inter-laboratory results)	**250 mL**
LGC6025 4005	**1**	**River Water – Anions** Collected 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 This material is intended for use in development, validation or quality control of analytical methods for the determination of anions in river waters. **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) ..... 66.2 ± 1.8 mg/L **Additional Value** Phosphate (as PO_4) 0.08 – 1.61 mg/L (Range of inter-laboratory results)	**250 mL**

Code	Batch	Description	Unit Size
		MISCELLANEOUS WATER MATERIALS	
LGC6016 4005	**1**	**Estuarine Water – Trace Metals** Collected from the Severn Estuary, UK, offshore from a heavily industrialised area near Avonmouth. This material is intended for use in development, validation or quality control of analytical methods for the determination of metals in estuarine water. **Certified Values** Cadmium ..... 101 ± 2 µg/kg Copper ..... 190 ± 4 µg/kg Lead ..... 196 ± 3 µg/kg Manganese ..... 976 ± 31 µg/kg Nickel ..... 186 ± 3 µg/kg **Indicative Values** Calcium ..... 220 mg/L Magnesium ..... 570 mg/L Potassium ..... 180 mg/L Sodium ..... 4700 mg/L Zinc ..... 55 µg/L	**50 mL**
LGC6175 4005	**1**	**Landfill Leachate – Trace Metals** A suitable supply of leachate was obtained and filtered through a 0.45 µm membrane filter. This material was stabilised with concentrated nitric acid to provide a pH of <2. This material is intended for use in development, validation or quality control of analytical methods for the determination of elements in landfill leachates. **Certified Values** Boron ..... 8.9 ± 0.5 mg/L Calcium ..... 148 ± 12 mg/L Iron ..... 1.05 ± 0.04 mg/L Magnesium ..... 221 ± 9 mg/L Manganese ..... 0.33 ± 0.02 mg/L Nickel ..... 0.09 ± 0.03 mg/L Potassium ..... 385 ± 15 mg/L Sodium ..... 860 ± 44 mg/L Zinc ..... 0.28 ± 0.03 mg/L	**50 mL**
LGC6177 4005	**1**	**Landfill Leachate – Trace Metals** Reference material collected from a landfill site in Loughborough, Leicestershire, UK. 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 suitable reference materials are not available. **Assessed Values** Boron ..... 9.8 ± 0.5 mg/L Calcium ..... 74.8 ± 1.7 mg/L Chromium ..... 0.18 ± 0.02 mg/L Iron ..... 3.8 ± 0.2 mg/L Magnesium ..... 73.5 ± 2.7 mg/L Manganese ..... 0.14 ± 0.02 mg/L Nickel ..... 0.21 ± 0.02 mg/L Phosphorus ..... 11.5 ± 1.5 mg/L Potassium ..... 780 ± 14 mg/L Sodium ..... 1750 ± 29 mg/L	**50 mL**

SEDIMENT MATERIALS

Code	Batch	Description	Unit Size
		SEDIMENT MATERIALS	
LGC6187 4005	**1**	**River Sediment – Extractable Metals** River sediment which was obtained from monitoring station lagoon on the River Elbe close to the Czech-German border. This material is intended for use in 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 suitable reference materials are not available. **Certified Values** Arsenic ..... 24.0 ± 3.2 mg/kg Cadmium..... 2.7 ± 0.3 mg/kg Chromium..... 84.0 ± 9.4 mg/kg Copper ..... 83.6 ± 4.1 mg/kg Iron..... 23600 ± 1500 mg/kg Lead ..... 77.2 ± 4.5 mg/kg Manganese..... 1240 ± 60 mg/kg Mercury.....1.4 ± 0.1 mg/kg Nickel.....34.7 ± 1.7 mg/kg Selenium.....1.2 ± 0.2 mg/kg Tin .....6.8 ± 1.8 mg/kg Vanadium .....38.3 ± 6.5 mg/kg Zinc.....439 ± 26 mg/kg **Indicative Value** Loss on ignition .....12 g/100 g	**80 g**
LGC6188 4005	**1**	**River Sediment – PAHs** River sediment was taken from a monitoring station lagoon on the river Elbe close to the Czech- German border. This material is intended for use in development, validation or quality control of analytical methods for the determination of polyaromatic hydrocarbons (PAHs) in sediments. **Assessed Values** Naphthalene..... 0.22 ± 0.11 mg/kg Acenaphthene ..... 0.07 ± 0.02 mg/kg Fluorene ..... 0.12 ± 0.04 mg/kg Phenanthrene..... 1.04 ± 0.30 mg/kg Anthracene..... 0.36 ± 0.11 mg/kg Fluoranthene ..... 1.79 ± 0.35 mg/kg Pyrene..... 1.48 ± 0.50 mg/kg Chrysene..... 0.83 ± 0.16 mg/kg Benzo[a]anthracene.....0.83 ± 0.18 mg/kg Benzo[b]fluoranthene.....0.82 ± 0.19 mg/kg Benzo[k]fluoranthene.....0.50 ± 0.08 mg/kg Benzo[a]pyrene.....0.65 ± 0.14 mg/kg Dibenzo[a,h]anthracene..0.13 ± 0.05 mg/kg Indeno[1,2,3-cd]pyrene...0.37 ± 0.14 mg/kg Benzo[ghi]perylene.....0.36 ± 0.13 mg/kg	**30 g**

Code	Batch	Description	Unit Size
LGC6189  4005	**1**	**River Sediment – Extractable Metals** River sediment was collected from a monitoring station lagoon on the River Elbe close to the Czech-German border. Assessed values for extractable metals precisely following the ISO11466 (1995) method. Only those metals that reached a plateau of concentration after two hours reflux were characterised. 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. **Assessed Values** Arsenic ..... 26 ± 2 mg/kg Cadmium ..... 3.3 ± 0.5 mg/kg Chromium ..... 93 ± 8 mg/kg Copper ..... 87 ± 8 mg/kg Lead ..... 87 ± 6 mg/kg Manganese ..... 1120 ± 60 mg/kg Molybdenum ..... 1.2 ± 0.1 mg/kg Nickel ..... 34 ± 3 mg/kg Zinc ..... 460 ± 30 mg/kg **Indicative Values** Barium ..... 280 mg/kg Selenium ..... 1.2 mg/kg Loss on Drying ..... 1.6 g/100 g pH ..... 7.1 Conductivity ..... 1470 µS/cm Loss on Ignition ..... 9.35 g/100 g Quartz SiO_2 ..... Major Albite $NaAlSi_3O_8$ ..... Minor Calcite $CaCO_3$ ..... Minor SiO_2 ..... 50 % Al_2O_3 ..... 10 % CaO ..... 4 % Fe_2O_3 ..... 5 % MgO ..... 1 % P_2O_5 ..... 2 % SO_3 ..... 1 % K_2O ..... 2 % Kaolinite Clay ..... Small Muscovite Clay ..... Small	**30 g**

Code	Batch	Description	Unit Size
		SOIL MATERIALS	
ERM-CC135 4005	**a**	**Brick Works Soil – Metals** This material is a contaminated soil that was obtained from a brickworks site in Hackney, London. 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 extractable metal content refers to metals soluble in aqua regia using methods based on ISO11466 (1995). **Certified Values** **Total Metal Content** Barium..... 305 ± 37 mg/kg Calcium ..... 23400 ± 2900 mg/kg Chromium..... 455 ± 59 mg/kg Copper ..... 107 ± 5 mg/kg Iron..... 47500 ± 4600 mg/kg Lead ..... 411 ± 26 mg/kg Magnesium..... 9400 ± 1200 mg/kg Manganese.....390 ± 40 mg/kg Nickel.....291 ± 22 mg/kg Potassium..... 16300 ± 2600 mg/kg Sodium .....1700 ± 270 mg/kg Vanadium .....139 ± 18 mg/kg Zinc.....345± 49 mg/kg **Extractable Metal Content** Aluminium……...22700 ± 4600 mg/kg Barium……..134 ± 10 mg/kg Mercury……3.2 ± 0.4 mg/kg Beryllium ..... 1.4 ± 0.4 mg/kg Calcium ..... 21900 ± 520 mg/kg Chromium..... 336 ± 28 mg/kg Cobalt..... 20 ± 4 mg/kg Copper ..... 105 ± 5 mg/kg Iron..... 40900 ± 2700 mg/kg Lead.....391 ± 16 mg/kg Magnesium .....7000 ± 580 mg/kg Manganese .....348 ± 18 mg/kg Nickel.....277 ± 13 mg/kg Potassium.....5100 ± 920 mg/kg Selenium..... 0.9 0177 0.3 mg/kg Sodium .....362 ± 44 mg/kg Vanadium .....78 ± 11 mg/kg Zinc..... 316 ± 4 mg/kg **Additional Material Information** **Extractable Metal Content** 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	**50 g**
LGC6115 4005	**1**	**Contaminated Soil – PCBs and PAHs** This material was sourced and prepared under contract by an experienced commercial laboratory. This material is intended for use in validating methods for the determination of PCBs and PAHs in soil materials. **Certified Values** PCB101.....93 ± 7 µg/kg PCB118.....116 ± 4 µg/kg Phenanthrene.....178 ± 6 mg/kg Fluoranthene .....312 ± 7 mg/kg Benzoanthracene.....36 ± 1 mg/kg Benzopyrene.....13 ± 0.02 mg/kg Benzoperylene.....0.33 ± 0.06 mg/kg	**50 g**

Code	Batch	Description	Unit Size
LGC6145 4005	**1**	**Contaminated Clay Loam Soil – Extractable Metals, PAHs and Inorganics** This material was blended from two soils, sourced from the Czech Republic and one soil sourced from the UK. This material is intended for use in validating methods for the determination of metals in soil materials. The extractable metal content refers to metals soluble in aqua regia using methods based on ISO 11466:1995. **Certified Values** Arsenic ..... 38.7 ± 1.2 mg/kg Cadmium..... 0.65 ± 0.07 mg/kg Chromium..... 47.6 ± 1.8 mg/kg Copper ..... 62.2 ± 3.6 mg/kg Lead ..... 45.1 ± 2.3 mg/kg Nickel.....39.0 ± 2.5 mg/kg Selenium.....1.81 ± 0.13 mg/kg Vanadium.....53.9 ± 2.3 mg/kg Zinc.....137 ± 6 mg/kg **Indicative Values** Naphthalene..... 9.3 ± 2.3 mg/kg Acenaphthylene..... 0.79 ± 0.11 mg/kg Phenanthrene..... 325 ± 26 mg/kg Anthracene..... 8.4 ± 1.6 mg/kg Chrysene..... 45 ± 9 mg/kg Benzo(*b*)fluroanthene.....12 ± 3 mg/kg Indeno*(123-cd)*pyrene....0.97 ± 0.28 mg/kg Water soluble chloride.....65 ± 9 mg/kg Water soluble sulfate.....5.3 ± 0.7 g/L	**50 g**
LGCQC3013	**1**	**Loamy Sand Soil 2 – Total Petroleum Hydrocarbons (TPH)** This material was prepared from a soil sample obtained from a contaminated electricity sub-station site in the UK. This material is intended for use as a quality control material for analytical methods used in the investigation of soil for TPH contamination. **Textural Classification- Loamy Sand** Sand 2.00 – 0.063 mm .....87 % m/m Silt 0.063 – 0.002 mm.....6 % m/m Clay <0.002 mm..... 7 % m/m **Indicative Value** TPH (C_{10} – C_{40}) ..... 4100 mg/kg	**100 g**

Code	Batch	Description	Unit Size
		SEWAGE SLUDGE MATERIALS	
ERM-CC136 4005	**a**	**Sewage Sludge – Metals** Aged sewage sludge collected from a disused sewage works site at Heathrow in London, UK. Dried, sterilised and ground to a powder. The extractable metal content refers to metals soluble in aqua regia using methods based on ISO 11466:1995. 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. **Assessed Values** Aluminium ..... 15100 ± 5400 mg/kg Barium..... 633 ± 195 mg/kg Chromium..... 399 ± 32 mg/kg Cobalt..... 23.2 ± 3.6 mg/kg Copper ..... 464 ± 21 mg/kg Iron..... 22200 ± 2780 mg/kg Lead ..... 341 ± 18 mg/kg Magnesium .....2820 ± 540 mg/kg Manganese.....544 ± 32 mg/kg Nickel.....130 ± 10 mg/kg Potassium.....2030 ± 844 mg/kg Sodium .....397± 64 mg/kg Zinc.....890 ± 140 mg/kg	**25 g**
LGC6181 4005	**1**	**Sewage Sludge – Extractable Metals** 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. 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 extractable metal content refers to metals soluble in aqua regia using methods based on ISO 11466:1995. **Certified Values** Arsenic ..... 7.8 ± 0.9 mg/kg Cadmium..... 5.8 ± 0.3 mg/kg Chromium..... 78 ± 8 mg/kg Copper ..... 354 ± 18 mg/kg Iron..... 40300 ± 2300 mg/kg Lead ..... 105 ± 8 mg/kg Manganese.....454 ± 23 mg/kg Mercury.....4.9 ± 0.4 mg/kg Nickel.....45 ± 3 mg/kg Silver .....55 ± 5 mg/kg Vanadium .....20 ± 2 mg/kg Zinc.....1100 ± 50 mg/kg	**100 g**
LGC6182 4005	**1**	**Sewage Sludge – PAHs** Digested sewage sludge of mixed origin was taken from a city water treatment plant immediately after discharge from a digestion tank. This material is intended for use in development, validation or quality control of analytical methods for the determination of PAHs in sewage sludge. **Assessed Values** Acenaphthene ..... 0.10 ± 0.04 mg/kg Anthracene..... 0.17 ± 0.06 mg/kg Benzo(*a*)anthracene ..... 0.66 ± 0.24 mg/kg Benzo(*b*)fluoranthene ... 0.95 ± 0.27 mg/kg Benzo(*k*)fluoranthene ... 0.45 ± 0.10 mg/kg Benzo(*g,h,i*)perylene .... 0.62 ± 0.31 mg/kg Benzo(*a*)pyrene..... 0.59 ±0.14 mg/kg Chrysene .....0.84 ± 0.17 mg/kg Fluoranthene.....1.81 ± 0.45 mg/kg Fluorene .....0.19 ± 0.06 mg/kg Indeno(*1,2,3-c,d*)pyrene 0.58 ± 0.14 mg/kg Naphthalene .....0.33 ± 0.15 mg/kg Phenanthrene .....1.04 ± 0.27 mg/kg Pyrene .....1.53 ± 0.47 mg/kg **Indicative Values** Acenaphthylene.....0.2 mg/kg Dibenzo(*a,h*)anthracene .....0.07 mg/kg	**30 g**

Code	Batch	Description	Unit Size
LGC6184 4005	**1**	**Sewage Sludge – PCBs** Digested sewage sludge of mixed origin, taken from a city water treatment plant in the Czech Republic, immediately after discharge from a digestion tank. This material is intended for use in development, validation or quality control of analytical methods for the determination of polychlorinated biphenyls in sewage sludge. **Certified Values** PCB 101 ..... 37 ± 3 µg/kg PCB 118 ..... 17 ± 2 µg/kg PCB 153 ..... 112 ± 8 µg/kg **Assessed Values** PCB 28 ..... 28 ± 8 µg/kg PCB 52 ..... 14 ± 4 µg/kg PCB 138 ..... 77 ± 7 µg/kg PCB 149 ..... 63 ± 6 µg/kg PCB 170 ..... 37 ± 5 µg/kg PCB 180 ..... 78 ± 10 µg/kg PCB 187 ..... 35 ± 5 µg/kg PCB 194 ..... 13 ± 3 µg/kg **Indicative Values** PCB 31 ..... 18 µg/kg PCB 77 ..... 3 µg/kg PCB 110 ..... 26 µg/kg	**30 g**

Code	Batch	Description	Unit Size
		ASH MATERIALS	
LGC6180 4005	**1**	**Pulverised Fuel Ash – Extractable and Total Metals** This material was obtained from a disposal site near Carmarthen Bay in South Wales, UK. Pulverised fuel ash is a waste product of coal-fired power stations. 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 extractable metal content refers to metals soluble in aqua regia using methods based on ISO 11466:1995. **Assessed Values** **Extractable Metal Content** Aluminium ..... 25700 ± 6300 mg/kg Arsenic ..... 91.7 ± 14.1 mg/kg Barium..... 676 ± 92 mg/kg Calcium ..... 6415 ± 530 mg/kg Chromium..... 43.8 ± 11.7 mg/kg Cobalt..... 18.5 ± 4.3 mg/kg Copper ..... 67.9 ± 11.2 mg/kg Lead ..... 48.6 ± 11.3 mg/kg Magnesium ..... 3660 ± 440 mg/kg Manganese..... 259 ± 40 mg/kg Nickel..... 48.4 ± 12.5 mg/kg Potassium..... 6170 ± 1680 mg/kg Sodium ..... 1230 ± 480 mg/kg Vanadium ..... 105 ± 15 mg/kg Zinc..... 115 ± 21 mg/kg **Indicative Values** **Extractable Metal Content** Antimony ..... 12 mg/kg Beryllium ..... 2.3 mg/kg Boron ..... 25 mg/kg Iron ..... 32900 mg/kg Lithium ..... 46 mg/kg Mercury..... 0.5 mg/kg Selenium..... 2 mg/kg Titanium..... 610 mg/kg **Total Metal Content** Aluminium ..... 13100 mg/kg Antimony ..... 16 mg/kg Arsenic ..... 100 mg/kg Barium..... 1300 mg/kg Beryllium ..... 6 mg/kg Calcium ..... 9200 mg/kg Chromium..... 140 mg/kg Cobalt..... 41 mg/kg Copper ..... 130 mg/kg Iron..... 52400 mg/kg Lead ..... 110 mg/kg Lithium..... 130 mg/kg Magnesium ..... 8500 mg/kg Manganese..... 410 mg/kg Molybdenum ..... 5 mg/kg Nickel..... 110 mg/kg Potassium..... 29600 mg/kg Selenium..... 3 mg/kg Sodium ..... 5100 mg/kg Tin ..... 7 mg/kg Titanium..... 4400 mg/kg Vanadium ..... 260 mg/kg Zinc..... 260 mg/kg	**50 g**

FOOD MATRIX PRODUCTS

Code	Batch	Description	Unit Size
		MILK AND MILK PRODUCTS	
LGC7104 4005	**1**	**Sterilised Cream – Proximates and Nutrient Elements** A cream product was prepared by a UK food company. This material is intended for use in development, validation or quality control of analytical methods for the determination of the major constituents and elements in foods. **Assessed Values** Calcium ..... 845 ± 36 mg/kg Magnesium..... 84 ± 4 mg/kg Nitrogen..... 0.40 ± 0.03 g/100 g Phosphorus ..... 823 ± 44 mg/kg Potassium ..... 1160 ± 100 mg/kg Sodium .....505 ± 37 mg/kg Zinc.....3.1 ± 0.4 mg/kg Ash .....0.58 ± 0.06 g/100 g Moisture.....70.2 ± 0.8 g/100 g Total Fat .....22.7 ± 0.7 g/100 g **Indicative Values** Lactose.....3.4 g/100 g Chloride .....750 mg/kg	**170 g**
		MEAT AND MEAT PRODUCTS	
ERM-BB501 4005	**b**	**Processed Meat – Proximates, Chloride, Nitrate and Hydroxyproline** This material was prepared using a commercial pork-based processed meat. After thorough mincing and mixing the meat was heat treated to sterilise. This material is intended for use in the development, validation or quality control of analytical methods for the determination of the major constituents and selected additives in meat and meat products. **Certified Values** Moisture ..... 68.59 ± 0.49 g/100 g Nitrogen..... 2.723 ± 0.075 g/100 g Total fat ..... 11.57 ± 0.44 g/100 g Ash..... 2.998 ± 0.041 g/100 g Iron..... 0.78 ± 0.18 mg/100 g Potassium ..... 286 ± 13 mg/100 g Chloride .....1.110 ± 0.042 g/100 g Hydroxyproline....0.197 ± 0.014 g/100 g Calcium.....5.9 ± 1.1 mg/100 g Phosphorus .....278 ± 15 mg/100 g Magnesium .....18.0 ± 1.4 mg/100 g Sodium .....873 ± 40 mg/100 g **Additional Information** Nitrate (as NO_3).....16 mg/kg Range (9 – 34 mg/kg) Nitrite (as NO_2) .....1.3 mg/kg Range (0.6 – 3 mg/kg) **Calculated Values** Sodium chloride..... 1.83 ± 0.7 g/100 g	**50 g**
LGC7220 4005	**2**	**Ground Raw Horsemeat** Horsemeat was purchased from a commercial source as two pieces of rump. The pieces were trimmed and the lean meat homogenised to produce a paste. This material is intended for use as a reference material in procedures for the identification of horsemeat The species content of this material was checked using both an immunoassay test and DNA analysis. **Assessed Value** Ground Raw Horsemeat	**10 g**
LGC7221 4005	**3**	**Ground Raw Beef** Beef was purchased from a commercial source as one piece of topside. The piece was trimmed and the lean meat homogenised to produce a paste. This material is intended for use as a reference material in procedures for the identification of beef. The species content of this material was checked using both an immunoassay test and DNA analysis. **Assessed Value** Ground Raw Beef	**10 g**

Code	Batch	Description	Unit Size
LGC7222  4005	**2**	**Ground Raw Pork** Pork was purchased from a commercial source as three pieces of boned leg. The pieces were trimmed and the lean meat homogenised to produce a paste. This material is intended for use as a reference standard (positive control) in procedures for the identification of pork. The species content of this material was checked using both an immunoassay test and DNA analysis. **Assessed Value** Ground Raw Pork	**10 g**
LGC7223  4005	**1**	**Ground Raw Sheep Meat** Sheep meat was purchased from a commercial source as four pieces labelled as lamb leg. The pieces were trimmed and the lean meat homogenised to produce a paste. This material is intended for use as a reference standard (positive control) in procedures for the identification of sheep products. The species content of this material was checked using both an immunoassay test and DNA analysis. **Assessed Value** Ground Raw Sheep Meat	**10 g**
LGC7224  4005	**1**	**Ground Raw Chicken Meat** Chicken was was purchased from a commercial source as four birds, labelled as whole chicken. The pieces were trimmed and the lean meat homogenised to produce a paste. This material is intended for use as a reference standard (positive control) in procedures for the identification of chicken. The species content of this material was checked using both an immunoassay test and DNA analysis. **Assessed Value** Ground Raw Chicken Meat	**10 g**
LGC7225  4005	**1**	**Ground Raw Turkey Meat** Turkey was purchased from a commercial source as two birds, labelled as whole turkey. The pieces were trimmed and the lean meat homogenised to produce a paste. This material is intended for use as a reference standard (positive control) in procedures for the identification of turkey. The species content of this material was checked using both an immunoassay test and DNA analysis. **Assessed Value** Ground Raw Turkey Meat	**10 g**
LGC7226  4005	**1**	**Ground Raw Goat Meat** Goat meat was purchased from a commercial source as two pieces labelled as bone-in leg. The pieces were surface trimmed and then prepared by removing any separable fat, gristle, etc. retaining the lean meat. The lean meat was cubed, homogenised in a food processor, combined and then mixed. This material is intended for use as a reference standard (positive control) in procedures for the identification of goat. The species content of this material was checked using DNA sequencing, a PCR based method and an immunoassay method. **Assessed Value** Ground Raw Goat Meat	**10 g**

Code	Batch	Description	Unit Size
LGC7240	**2**	**1 % w/w Horsemeat in Beef (nominal)** The material was prepared by weighing the required amounts of authentic meat materials LGC7220 Horsemeat and LGC7221 Beef into 50 mL screw-cap sample containers. This material is intended for use as a positive control material in procedures for the identification of horsemeat in beef. **Assessed Value** Horsemeat as a percentage of total meat ....1 %	**2 g**
LGC7241	**2**	**10 % w/w Horsemeat in Beef (nominal)** The material was prepared by weighing the required amounts of authentic meat materials LGC7220 Horsemeat and LGC7221 Beef into 50 mL screw-cap sample containers. This material is intended for use as a positive control material in procedures for the identification of horsemeat in beef. **Assessed Value** Horsemeat as a percentage of total meat ..10 %	**2 g**
LGC7242	**2**	**1 % w/w Pork in Beef (nominal)** The material was prepared by weighing the required amounts of authentic meat materials LGC7222 Pork and LGC7221 Beef into 50 mL screw-cap sample containers. This material is intended for use as a positive control material in procedures for the identification of pork in beef. **Assessed Value** Pork as a percentage of total meat .....1 %	**2 g**
LGC7243	**2**	**10 % w/w Pork in Beef (nominal)** The material was prepared by weighing the required amounts of authentic meat materials LGC7222 Pork and LGC7221 Beef into 50 mL screw-cap sample containers. This material is intended for use as a positive control material in procedures for the identification of pork in beef. **Assessed Value** Pork as a percentage of total meat .....10 %	**2 g**
LGC7244	**1**	**1 % w/w Chicken Meat in Sheep Meat (nominal)** This material was prepared by weighing the required amounts of authentic meat materials LGC7224 Chicken Meat and LGC7223 Sheep Meat into 50 mL screw-cap sample containers. The material is intended for use as a reference material (positive control) in procedures for the identification of chicken meat in sheep meat. **Assessed Value** Chicken Meat as a percentage of total meat……1 %	**2 g**
LGC7245	**1**	**5 % w/w Chicken Meat in Sheep Meat (nominal)** This material was prepared by weighing the required amounts of authentic meat materials LGC7224 Chicken Meat and LGC7223 Sheep Meat into 50 mL screw-cap sample containers. The material is intended for use as a reference material (positive control) in procedures for the identification of chicken meat in sheep meat. **Assessed Value** Chicken Meat as a percentage of total meat……5 %	**2 g**

Code	Batch	Description	Unit Size
LGC7246	**1**	**1 % w/w Turkey Meat in Sheep Meat (nominal)** This material was prepared by weighing the required amounts of authentic meat materials LGC7225 Turkey Meat and LGC7223 Sheep Meat into 50 mL screw-cap sample containers. The material is intended for use as a reference material (positive control) in procedures for the identification of turkey meat in sheep meat. **Assessed Value** Turkey Meat as a percentage of total meat……1 %	**2 g**
LGC7247	**1**	**5 % w/w Turkey Meat in Sheep Meat (nominal)** This material was prepared by weighing the required amounts of authentic meat materials LGC7225 Turkey Meat and LGC7223 Sheep Meat into 50 mL screw-cap sample containers. The material is intended for use as a reference material (positive control) in procedures for the identification of turkey meat in sheep meat. **Assessed Value** Turkey Meat as a percentage of total meat……5 %	**2 g**
LGC7248	**1**	**1 % w/w Beef in Sheep Meat (nominal)** This material was prepared by weighing the required amounts of authentic meat materials, LGC7221 Beef and LGC7223 Sheep Meat into 50 mL screw-cap sample containers. The material is intended for use as a reference material (positive control) in procedures for the identification of beef in sheep meat. **Assessed Value** Beef as a percentage of total meat……1 %	**2 g**
LGC7249	**1**	**5 % w/w Beef in Sheep Meat (nominal)** This material was prepared by weighing the required amounts of authentic meat materials, LGC7221 Beef and LGC7223 Sheep Meat into 50 mL screw-cap sample containers. The material is intended for use as a reference material (positive control) in procedures for the identification of beef in sheep meat. **Assessed Value** Beef as a percentage of total meat……5 %	**2 g**

Code	Batch	Description	Unit Size
		FISH AND FISH MATERIALS	
LGC7164  4005	**1**	**Crab Paste – Proximates and Elements** Brown crab meat purchased from a commercial supplier was blended with small amounts of sodium polyphosphate, sodium chloride and water to a smooth paste. The paste was dispensed into cans, sealed and then heat treated to ensure sterility. For constituents where the assigned value is described as Certified or Assessed, the intended use of this material is for the development, validation, (including the assessment of method bias), and quality control of methods for the analysis of crab and seafood products. Where the assigned value is described as Indicative, the material is suitable for monitoring the performance of a method or analyst, but not suitable for assessing method bias. The material may also be applicable to other similar matrices and procedures where suitable reference materials are not available. **Certified Values** Moisture..... 59.26 ± 0.56 g/100 g Nitrogen..... 3.541 ± 0.087 g/100 g Total fat ..... 12.13 ± 0.72 g/100 g Ash..... 2.855 ± 0.059 g/100 g Chloride..... 0.78 ± 0.10 g/100 g Calcium ..... 348 ± 35 mg/100 g Cadmium..... 9.20 ± 0.48 mg/kg Copper ..... 20.1 ± 2.4 mg/kg Lead..... 0.0697 ± 0.0047 mg/kg Magnesium ..... 43.1 ± 3.8 mg/100 g Manganese..... 3.28 ± 0.29 mg/kg Phosphorus..... 564 ± 40 mg/100 g Potassium..... 179 ± 11 mg/100 g Sodium ..... 463 ± 45 mg/100 g Zinc..... 56.8 ± 5.5 mg/kg **Assessed Values** Arsenic ..... 13.8 ± 1.8 mg/kg Cobalt..... 0.131 ± 0.022 mg/kg Iron ..... 3.17 ± 0.54 mg/kg **Indicative Values** Aluminium..... Range 1 – 4 mg/kg Chromium..... Range 0.1 – 1.0 mg/kg Mercury ..... Range 0.08 – 0.11mg/kg Nickel..... Range 0.1 – 1.1 mg/kg Selenium..... Range 1.4 – 4.0 mg/kg Tin ..... Range 0.01 – 0.15 mg/kg	**140 g**

Code	Batch	Description	Unit Size
		FRUIT AND VEGETABLE PRODUCTS	
ERM-BC084 4005	**a**	**Tomato Paste – Metals** This material was prepared by adding solutions containing cadmium, tin and lead to a commercial tomato paste. This material is intended for use in the validation of methods for the determination of tin, lead and cadmium in a fruit or vegetable based material. **Certified Values** Cadmium ..... 0.112 ± 0.007 mg/kg Lead ..... 0.316 ± 0.021 mg/kg Tin ..... 225 ± 11 mg/kg **Additional Material Information** Total Solids..... 290 g/kg	**50 g**
LGC7111 4005	**2**	**Potato Powder – Sulfur Dioxide** Sachets of potato powder were purchased from a commercial producer. This material is intended for use in development, validation or quality control of analytical methods for the determination of the sulfur dioxide in dry foods. **Assessed Value** Total Sulfur Dioxide ..... 212 ± 27 mg/kg	**110 g**
LGC7162	**1**	**Strawberry Leaves – Trace Elements** The raw material was collected from a private farm in the Czech Republic. The mixture was cut and jet milled to pass a 250 µm nylon sieve. The resulting powder was homogenised, separated in 20 g portions and placed in 60 mL bottles. This material is intended for use in development, validation or quality control of analytical methods for the determination of elements in vegetation. **Certified Values** Arsenic ..... 0.28 ± 0.07 mg/kg Barium ..... 107 ± 10 mg/kg Cadmium ..... 0.17 ± 0.04 mg/kg Calcium ..... 1.53 ± 0.07 g/100 g Molybdenum ..... 0.32 ± 0.08 mg/kg Magnesium ..... 0.377 ± 0.017 g/100 g Chromium ..... 2.15 ± 0.34 mg/kg Cobalt ..... 0.47 ± 0.11 mg/kg Iron ..... 818 ± 48 mg/kg Lead ..... 1.8 ± 0.4 mg/kg Manganese ..... 171 ± 10 mg/kg Mercury ..... 0.027 ± 0.006 mg/kg Nickel ..... 2.6 ± 0.7 mg/kg Nitrogen ..... 2.01 ± 0.06 g/100 g Phosphorus ..... 0.260 ± 0.023 g/100 g Potassium ..... 1.96 ± 0.10 g/100 g Strontium ..... 64 ± 6 mg/kg Sulfur ..... 0.174 ± 0.016 g/100 g Zinc ..... 24 ± 5 mg/kg **Indicative Values** Total aluminium ..... 0.1 g/100 g Extractable aluminium ..... 0.06 g/100 g Copper ..... 10 mg/kg Lithium ..... 0.7 mg/kg Total sodium ..... 210 mg/kg Extractable sodium ..... 65 mg/kg Selenium ..... 0.04 mg/kg Vanadium ..... 1.8 mg/kg	**20 g**

Code	Batch	Description	Unit Size
		DRINK PRODUCTS	
ERM-BD011 4005	**a**	**Orange Juice** Commercially obtained orange juice was diluted with water. This material is intended for use as a reference material in the development, validation or quality control of analytical methods for the determination of degrees Brix or refractive index of sugar solutions and food extracts. **Certified Values** Degrees Brix.....1.26 ± 0.08 Refractive index..... 1.3348 ± 0.0002	**3 mL**
ERM-BD013 4005	**a**	**Orange Juice** Commercially obtained orange juice was enriched with sucrose. This material is intended for use as a reference material in the development, validation or quality control of analytical methods for the determination of degrees Brix or refractive index of sugar solutions and food extracts. **Certified Values** Degrees Brix.....22.07 ± 0.08 Refractive index.....1.3673 ± 0.0002	**3 mL**
ERM-BD014 4005	**a**	**Orange Juice** Commercially obtained orange juice was enriched with sucrose. This material is intended for use as a reference material in the development, validation or quality control of analytical methods for the determination of degrees Brix or refractive index of sugar solutions and food extracts. **Certified Values** Degrees Brix..... 55.55 ± 0.19 Refractive index..... 1.4320 ± 0.0005	**3 mL**
ERM-BD015 4005	**a**	**Orange Juice** Commercially obtained orange juice was enriched with sucrose. This material is intended for use as a reference material in the development, validation or quality control of analytical methods for the determination of degrees Brix or refractive index of sugar solutions and food extracts. **Certified Values** Degrees Brix.....64.73 ± 0.22 Refractive index.....1.4529 ± 0.0006	**3 mL**
LGC7140	**1**	**Soft Drink – Colours** Known weights of three food colours were added to a diluted solution of commercial soft drink concentrate. This material is intended for use in the development, validation or quality control of methods for the determination of Ponceau 4R (E124), Sunset Yellow (E110) and Tartrazine (E102). **Certified Values** Ponceau 4R (E124) .....18.7 ± 0.2 mg/L Tartrazine (E102).....29.9 ± 0.3 mg/L Sunset yellow (E110)....19.6 ± 0.2 mg/L	**60 mL**

Code	Batch	Description	Unit Size
		PROCESSED FOOD PRODUCTS	
ERM-BC210 4005	**a**	**Wheat Flour Selenium and Selenomethionine** Selenised wheat was obtained from a UK university. The grain was cleaned with water, milled at a temperature between 18 ℃ and 20 ℃ and 60 % relative humidity, and sieved twice to a final particle size of 140 µm. The primary use of this certified reference material is for the validation of methods for the determination of selenium and selenomethionine in food materials and dietary supplements. **Certified Values** Total selenium ..... 17.23 ± 0.91 mg/L Selenomethionine .....27.4 ± 2.6 mg/L	**30 g**
ERM-BD017 4005	**a**	**Sponge Cake - Proximates** Plain sponge cakes were prepared and canned by a commercial food company. This material is intended for use in development, validation or quality control of analytical methods for the determination of major constituents in baked goods. The material may also be applicable to other similar matrices where suitable reference materials are not available. **Certified Values** Moisture ..... 24.2 ± 2.0 g/100 g Ash .....1.067 ± 0.064 g/100 g Nitrogen..... 0.746 ± 0.035 g/100 g Sucrose .....20.0 ± 2.5 g/100 g Total fat ..... 22.0 ± 1.4 g/100 g **Additional Information** Starch..... 22.1 ± 2.2 g/100 g Fructose..... Range 0.04 – 0.5 g/100 g Glucose .....Range 0.1 – 1.1 g/100 g Lactose ..... Range 0.4 – 1.3 g/100 g	**355 g**
LGC7016 4005	**3**	**Chocolate Confectionery** A commercial supply of sugar confectionery was obtained. This material is intended for use in development, validation or quality control of analytical methods for the determination of sugar in foodstuffs. **Assessed Values** Lactose..... 7.06 ± 0.96 g/100 g Butyric acid in fat..... 0.677 ± 0.071 g/100 g Sucrose ..... 46.5 ± 2.3 g/100 g Nitrogen ..... 1.274 ± 0.024 g/100 g Total fat ..... 29.64 ± 0.35 g/100 g **Indicative Values** Fructose .....0.2 g/100 g Glucose ..... 0.2 g/100 g **Calculated Values** Milk in fat .....19.6 g/100 g Milk fat in sample ..... 5.8 g/100 g	**15 g**
LGC7017 4005	**2**	**Sugar Confectionery** A commercial supply of sugar confectionery was obtained. This material is intended for use in development, validation or quality control of analytical methods for the determination of sugar in foodstuffs. **Assessed Values** Glucose..... 9.7 ± 0.6 g/100 g Sucrose .....52.6 ± 3.7 g/100 g Fructose ..... 2.3 ± 0.2 g/100 g Maltose.....4.2 ± 0.7 g/100 g	**15 g**

Code	Batch	Description	Unit Size
LGC7103  4005	**3**	**Sweet Digestive Biscuit** Wholemeal digestive biscuits were obtained from a commercial supplier. This material is intended for use in the development, validation or quality control of analytical methods for the determination of proximates, sugars and elements in food. The material may also be applicable to other matrices where suitable materials are not available. **Assessed Values** Nitrogen..... 1.06 ± 0.2 g/100 g Total fat ..... 20.9 ± 0.5 g/100 g Ash..... 2.08 ± 0.10 g/100 g Fructose.....0.24 ± 0.06 g/100 g Sucrose .....16.6 ± 0.8 g/100 g Chloride .....0.55 ± 0.05 g/100 g **Indicative Value** Sodium..... 6300 ± 320 mg/kg Potassium ..... 1530 ± 80 mg/kg Phosphorus ..... 870 ± 50 mg/kg Manganese.....5.9 ± 0.7 mg/kg Zinc.....5.8 ± 0.6 mg/kg	**50 g**
LGCQC101-KT	**1**	**Chocolate Mousse Dessert – Peanut Protein** The materials were prepared by mixing commercial, dry food ingredients to make a paste. Peanut protein was added to LGCQC1012 using a commercial defatted peanut flour (57 g/100 g protein content). The materials are intended for use as quality control materials for analytical methods used in the determination of peanut protein in foods. They are not suitable for establishing method bias. **Indicative Value** LGCQC1011 Peanut protein..... <1 mg/kg negative control LGCQC1012 Peanut protein..... 10 mg/kg positive control	**2 x 5 g**

ALCOHOL MATRIX MATERIALS

Code	Batch	Description	Unit Size
ERM-AC404 4005	**h**	**Reference Spirit – 5 % ABV** A suitable supply of ethanol was obtained, checked for purity and diluted with water to produce a solution with a nominal ethanol concentration of 5 % ABV. The primary use of this reference material is for checking the calibration of automatic density meters commonly used in industry to determine alcoholic strength, and for checking analyst and method performance. **Certified Values** Alcoholic Strength....5.00 ± 0.03 % ABV Density ..... 990.00 ± 0.04 kg/m^3	**25 mL**
ERM-AC405 4005	**c**	**Reference Spirit – 15 % ABV** A suitable supply of ethanol was obtained, diluted volumetrically with water to produce a solution with a nominal ethanol concentration of 15 % ABV. The primary use of this reference material is for checking the calibration of automatic density meters commonly used in industry to determine alcoholic strength, and for checking analyst and method performance. **Certified Values** Alcoholic Strength..14.99 ± 0.05 % ABV Density ..... 977.94 ± 0.05 kg/m^3	**50 mL**
ERM-AC406 4005	**f**	**Reference Spirit – 40 % ABV** A suitable supply of ethanol was obtained, diluted volumetrically with water to produce a solution with a nominal ethanol concentration of 40 % ABV. The primary use of this reference material is for checking the calibration of automatic density meters commonly used in industry to determine alcoholic strength, and for checking analyst and method performance. **Certified Values** Alcoholic Strength..39.98 ± 0.04 % ABV Density ..... 947.01 ± 0.06 kg/m^3	**25 mL**
ERM-AC407 4005	**d**	**Reference Spirit – 70 % ABV** A suitable supply of ethanol was obtained, diluted volumetrically with water to produce a solution with a nominal ethanol concentration of 70 % ABV. The primary use of this reference material is for checking the calibration of automatic density meters commonly used in industry to determine alcoholic strength, and for checking analyst and method performance. **Certified Values** Alcoholic Strength..70.09 ± 0.03 % ABV Density ..... 884.27 ± 0.07 kg/m^3	**25 mL**
ERM-AC410 4005	**a**	**Reference Spirit – 40 % ABV** A suitable supply of ethanol was obtained, diluted volumetrically with water to produce a solution with a nominal ethanol concentration of 40 % ABV. The primary use of this reference material is for checking the calibration of automatic density meters commonly used in industry to determine alcoholic strength, and for checking analyst and method performance. **Certified Values** Alcoholic Strength..40.08 ± 0.04 % ABV Density ..... 946.86 ± 0.06 kg/m^3	**50 mL**

Code	Batch	Description	Unit Size
ERM-BA005  4005	**a**	**Lager – 5 % ABV** A supply of pasteurised lager was obtained from a commercial source This material is intended for use as a reference material for the development, validation or quality control of methods for the determination of alcohol in alcoholic beverages. **Certified Value** Alcohol .....5.07 ± 0.05 %	**330 mL**
ERM-BA006  4005	**a**	**Brandy – 40 % ABV** A supply of brandy was obtained from a commercial source. This material is intended to be used for calibration of density meters and the validation of methods for the determination of alcoholic strength in obscured spirits by the UK statutory method of distillation and density measurement. **Certified Values** Apparent Alcoholic Strength .....37.83 ± 0.05 % ABV Actual Alcoholic Strength....40.12 +0.09 / - 0.11 % ABV Apparent Density..... 950.38 ± 0.07 kg/m^3	**50 mL**
ERM-BA001  4005	**a**	**Wine – 5 % ABV** A suitable supply of wine was obtained from a commercial source. The wine was stabilised with the addition of sodium metabisulfite and citric acid and thoroughly mixed. This material is intended for use as a reference material for the validation of methods for the determination of alcohol content in alcoholic beverages. **Certified Value** Alcohol .....5.37 ± 0.05 % (at 20 ℃)	**250 mL**
ERM-BA002  4005	**a**	**Wine – 10 % ABV** A suitable supply of wine was obtained from a commercial source. The wine was stabilised with the addition of sodium metabisulfite and citric acid and thoroughly mixed. This material is intended for use as a reference material for the validation of methods for the determination of alcohol content in alcoholic beverages. **Certified Value** Alcohol .....10.12 ± 0.04 % (at 20 ℃)	**250 mL**
ERM-BA003  4005	**a**	**Wine – 15 % ABV** A suitable supply of wine was obtained from a commercial source. The wine was stabilised with the addition of sodium metabisulfite and citric acid and thoroughly mixed. This material is intended for use as a reference material for the validation of methods for the determination of alcohol content in alcoholic beverages. **Certified Value** Alcohol .....14.47 ± 0.10 % (at 20 ℃)	**250 mL**
LGC5004	**1**	**Lager Shandy – Alcohol** A suitable supply of lager shandy was obtained from a commercial source. This material is intended for use in the validation of methods for the determination of alcohol. **Certified Value** Alcohol .....1.02 ± 0.02 %	**330 mL**

Code	Batch	Description	Unit Size
LGC5100  4005	**2**	**Whisky – Congeners** A suitable supply of whisky was obtained from a commercial source. This material is intended for use in development, validation or quality control of analytical methods for the determination of congeners in spirit samples. The material may also be applicable to other matrices where suitable reference materials are not available. **Certified Values** Methanol……..8.2 ± 0.6 g/100 L alcohol Propanol……..67.4 ± 1.7 g/100 L alcohol 2-Methyl propanol...64.9 ± 1.9 g/100 L alcohol 2-Methyl butanol……19.6 ± 1.0 g/100 L alcohol 3-Methyl butanol……54.4 ± 1.5 g/100 L alcohol 2+3-Methyl butanol...70.1 ± 1.6 g/100 L alcohol **Indicative Values** Acetaldehyde……..9 g/100 L alcohol Butanol……..0.6 g/100 L alcohol Ethyl acetate……24 g/100 L alcohol Furfural……1.3 g/100 L alcohol	**10 mL**

ANIMAL FEEDING STUFFS

Code	Batch	Description	Unit Size
LGC7173 4005	**3**	**Poultry Feed – Proximates and Elements** A sample of poultry feed was purchased from a commercial animal feed manufacturer. This material is intended for use in the development, validation or quality control of analytical methods for the determination of proximates and elements in animal feeding stuffs. **Assessed Values using Statutory Methods** Ash..... 6.4 ± 0.6 g/100 g Moisture..... 12.3 ± 0.3 g/100 g Oil..... 4.1 ± 0.7 g/100 g **Assessed Values** Ash..... 6.5 ± 0.6 g/100 g Crude fibre ..... 4.1 ± 0.7 g/100 g Moisture ..... 12.4 ± 0.3 g/100 g Oil..... 4.1 ± 0.7 g/100 g Sodium..... 0.17 ± 0.05 g/100 g Calcium ..... 1.44 ± 0.15 g/100 g Chloride..... 0.28 ± 0.06 g/100 g Magnesium ..... 0.16 ± 0.02 g/100 g Potassium..... 0.74 ± 0.06 g/100 g Nitrogen ..... 2.56 ± 0.19 g/100 g Phosphorus ..... 0.63 ± 0.03 g/100 g Iron ..... 145 ± 31 mg/kg Manganese..... 131 ± 19 mg/kg Zinc..... 91 ± 11 mg/kg **Indicative Values using Statutory Methods** Nitrogen..... 2.5 g/100 g Crude Fibre..... 4 g/100 g Starch..... 40 g/100 g **Indicative Values using a Variety of Methods** Fructose ..... <1 g/100 g Sucrose ..... 2 g/100 g Glucose..... <1 g/100 g Starch..... 40 g/100 g Maltose..... <5 g/100 g	**50 g**

INDUSTRIAL MATRIX MATERIALS

Code	*Batch*	*Description*	*Unit Size*
ERM-EB503 4005	**a**	**Automobile Catalyst – Platinum Group Elements** This material is a mixture of unused automobile catalysts supplied and prepared by a commercial manufacturer. This material is intended for use as a reference material in the development, validation or quality control of analytical methods for the determination of platinum group elements (PGE) in automobile catalysts. **Certified Values** Platinum ..... 1880 ± 30 mg/kg Palladium ..... 2780 ± 80 mg/kg **Indicative Value** Rhodium..... 220 mg/kg	**100 g**
ERM-EF212 4005	**a**	**Petrol – Sulfur** This material is a petroleum product containing sulfur in its natural forms, closely matching commercial petrol fuels. This material is intended for use in the development, validation or quality control of analytical methods for the determination of sulfur in petrol. **Certified Value** Sulfur..... 20.2 ± 1.1 mg/kg	**19 mL**
ERM-EF673 4005	**a**	**Diesel – Sulfur** This material is a petroleum product containing sulfur in its natural forms, closely matching commercial diesel fuels. This material is intended for use as a reference material in the development, validation or quality control of analytical methods for the determination of sulfur in diesel. **Certified Value** Sulfur..... 52.4 ± 1.3 mg/kg **Indicative Value** Density (in air) ..... 822.1 ± 0.2 kg/m^3	**100 mL**
ERM-EF674 4005	**a**	**Diesel – Sulfur** This material is a petroleum product containing sulfur in its natural forms, closely matching commercial diesel fuels. This material is intended for use as a reference material in the development, validation or quality control of analytical methods for the determination of sulfur in diesel. **Certified Value** Sulfur..... 11.0 ± 0.9 mg/kg **Indicative Value** Density (in air) ..... 826.5 ± 0.2 kg/m^3	**100 mL**

CLINICAL MATERIALS

Code	Batch	Description	Unit Size
WHOLE BLOOD MATERIAL			
ERM-DA110  4005	**a**	**Human Blood - Tacrolimus** The material was prepared by Analytical Services International (London, UK) by spiking blank pooled human whole blood with a standard solution of tacrolimus to give a nominal concentration of 8 µg/kg tacrolimus in blood. Characterisation was carried out at LGC using exact matching isotopic dilution mass spectrometry. This material is intended for use in the calibration of instruments, the validation of new methods, and monitoring the performance of methods commonly used in clinical laboratories to determine the tracrolimus content of human blood samples. **Certified Value** Tacrolimus..... 7.41 ± 0.25 µg/kg **Additional Material Information** Tacrolimus..... 7.82 ± 0.25 µg/L	**1 mL**

SERUM MATERIALS			
ERM-DA120  4005	**a**	**Frozen Human Serum – Trace Metals** Human serum from a single donor was prepared from blood obtained at the Royal Surrey County Hospital (Guildford, UK). This material is intended for the validation of new and existing methods, and monitoring the performance of methods, commonly used in clinical laboratories to determine the importance of trace elements copper, selenium and zinc in human serum samples. **Certified Values** Copper ..... 1130 ± 33 µg/kg Zinc ..... 658 ± 33 µg/kg Selenium..... 64.1 ± 3.0 µg/kg **Additional Material Data** Copper ..... 18.18 ± 0.53 µmol/L Zinc ..... 10.30 ± 0.52 µmol/L Selenium..... 0.830 ± 0.038 µmol/L	**2 mL**
ERM-DA200  4005	**a**	**Frozen Human Serum – Digoxin, High Level** Human serum from donors was supplied by Scipac (Sittingbourne, UK), and prepared by Cardiff Bioanalytical Services Ltd. This material is intended for the validation of new and existing methods, and monitoring the performance of methods, commonly used in clinical laboratories to determine the digoxin content of human serum samples. It can also be used in the training and evaluation of staff. The material is clinically relevant since it closely matches the upper decision level for digoxin monitoring **Certified Value** Digoxin ..... 2.08 ± 0.15 µg/kg **Additional Material Data** Digoxin ..... 2.74 ± 0.19 nmol/L Digoxin..... 2.14 ± 0.15 µg/L	**2 mL**
ERM-DA201  4005	**a**	**Frozen Human Serum – Digoxin, Low Level** Human serum from donors was supplied by Scipac (Sittingbourne, UK), and prepared by Cardiff Bioanalytical Services Ltd. This material is intended for the validation of new and existing methods, and monitoring the performance of methods, commonly used in clinical laboratories to determine the digoxin content of human serum samples. It can also be used in the training and evaluation of staff. The material is clinically relevant since it closely matches the lower decision level for digoxin monitoring **Certified Value** Digoxin ..... 0.845 ± 0.0.50 µg/kg **Additional Material Data** Digoxin ..... 1.110 ± 0.065 nmol/L Digoxin..... 0.868 ± 0.051 µg/L	**2 mL**

Code	Batch	Description	Unit Size
ERM-DA250  4005	**a**	**Creatinine and Electrolytes in Frozen Human Serum** Human blood serum was obtained from donors at the University Hospital of Wales. This material is intended for the validation and on-going monitoring of methods of analysis for the determination of creatinine and electrolytes in human blood samples **Certified Values** Creatinine..... 39.0 ± 2 mg/kg Calcium..... 123 ± 5 mg/kg Lithium ..... 6.6 ± 0.4 mg/kg Magnesium.....47 ± 3 mg/kg Potassium.....277 ± 14 mg/kg Sodium .....3370 ± 160 mg/kg	**1 mL**
ERM-DA251  4005	**A**	**Creatinine and Electrolytes in Frozen Human Serum** Human blood serum was obtained from donors at the University Hospital of Wales. This material is intended for the validation and on-going monitoring of methods of analysis for the determination of creatinine and electrolytes in human blood samples. **Certified Values** Creatinine..... 22 ± 2 mg/kg Calcium..... 71 ± 3 mg/kg Lithium ..... 4.5 ± 0.3 mg/kg Magnesium.....19 ± 2 mg/kg Potassium.....136 ± 7 mg/kg Sodium .....2740 ± 80 mg/kg	**1 mL**
ERM-DA252  4005	**a**	**Creatinine in Frozen Human Serum (Low)** Human blood serum was obtained from donors at the University Hospital of Wales. This material is intended for the validation and on-going monitoring of methods of analysis for the determination of creatinine in human blood samples. **Certified Value** Creatinine..... 3.1 ± 0.5 mg/kg **Additional Material Information** Calcium.....58 mg/kg Lithium .....1.3 mg/kg Magnesium.....8.1 mg/kg Potassium.....67 mg/kg Sodium .....2400 mg/kg	**1 mL**
ERM-DA253  4005	**a**	**Creatinine in Frozen Human Serum (High)** Human blood serum was obtained from donors at the University Hospital of Wales. This material is intended for use in the validation and ongoing monitoring of methods of analysis for the determination of creatinine in human blood samples. **Certified Value** Creatinine..... 50 ± 2 mg/kg	**1 mL**
ERM-DA345  4005	**a**	**Testosterone in Frozen Human Serum** Time-expired human blood serum from female donors was spiked with testosterone to bring the concentration within the normal range for male human serum. This material is intended for use in the validation and ongoing monitoring of methods of analysis for the determination of testosterone in human blood samples. **Certified Value** Testosterone ..... 5.58 ± 0.20 µg/kg	**0.8 mL**
ERM-DA346  4005	**a**	**Testosterone in Frozen Human Serum** Time-expired human blood serum from female donors was used with a concentration within the normal range for female human serum. This material is intended for use in the validation and ongoing monitoring of methods of analysis for the determination of testosterone in human blood samples. **Certified Value** Testosterone ..... 0.25 ± 0.04 µg/kg	**0.8 mL**

GYPSUM MATERIALS

Code	Batch	Description	Unit Size
LGC2700 4005	**1**	**Natural Gypsum – Major Oxides and Trace Elements** Natural gypsum, in the form of small chippings, was obtained from British Gypsum (East Leake, Leicestershire, UK). The material was prepared using a jaw crusher fitted with hardened chromium steel jaws to provide a powder, nominally 3 mm maximum diameter. The crushed material was dried at 30 ℃ in a calibrated drying oven. After drying, the material was milled until the powder passed a calibrated 75 µm stainless steel sieve mesh. This reference material is intended for use in the validation of new methods, and for monitoring the performance of methods commonly used in laboratories to analyse samples of gypsum for quality control and environmental monitoring purposes. **Certified Value** Mercury ..... 1.35 ± 0.40 µg/kg **Assessed Values** Aluminium (as Al_2O_3) ..... 2.872 ± 0.056 g/100 g Calcium (as CaO) ..... 26.31 ± 0.36 g/100 g Iron (as Fe_2O_3) ..... 1.150 ± 0.062 g/100 g Phosphorus (as P_2O_5) .. 0.0367 ± 0.0052 g/100 g Potassium (as K_2O) ..... 0.830 ± 0.024 g/100 g Nickel ..... 9.5 ± 2.0 mg/kg Vanadium ..... 21.3 ± 3.2 mg/kg Silicon (as SiO_2) ..... 10.93 ± 0.22 g/100 g Sodium (as Na_2O) ..... 0.183 ± 0.018 g/100 g Sulfur (as SO_3) ..... 34.67 ± 0.60 g/100 g Titanium (as TiO_2) ... 0.1480 ± 0.0075 g/100 g Loss on Ignition ..... 19.78 ± 0.71 g/100 g Zinc ..... 19.3 ± 3.8 mg/kg **Indicative Values** Magnesium (as MgO) ..... 3.2 g/100 g Manganese (as MnO) ..... 0.030 g/100 g Strontium (as SrO) ..... 0.20 g/100 g Arsenic ..... 2.4 mg/kg Barium ..... 170 mg/kg Chromium ..... 15 mg/kg Cobalt ..... 3.8 mg/kg Copper ..... 5.0 mg/kg Lead ..... 4.2 mg/kg Thallium ..... 0.18 mg/kg	**75 g**

Code	Batch	Description	Unit Size
LGC2701 4005	**1**	**Natural Anhydrite – Major Oxides and Trace Elements** Anhydrite, in the form of coarse chippings, was obtained from British Gypsum (East Leake, Leicestershire, UK). The material was prepared using a jaw crusher fitted with hardened chromium steel jaws to provide a powder, nominally 3 mm maximum diameter. The crushed material was dried at 30 ℃ in a calibrated drying oven. After drying, the material was milled until the powder passed a calibrated 75 µm stainless steel sieve mesh. This reference material is intended for use in the validation of new methods, and for monitoring the performance of methods commonly used in laboratories to analyse samples of gypsum for quality control and environmental monitoring purposes. **Certified Value** Mercury……..2.33 ± 0.18 µg/kg **Assessed Values** Aluminium (as Al_2O_3) .....0.045 ± 0.029 g/100 g Calcium(as CaO).....40.82 ± 0.67 g/100 g Iron (as Fe_2O_3).....0.0280 ± 0.0096 g/100 g Phosphorus (as P_2O_5)..0.0069 ± 0.0040 g/100 g Potassium (as K_2O). 0.0105 ± 0.0050 g/100 g Silicon (as SiO_2) ..... 0.112 ± 0.044 g/100 g Sulfur (as SO_3) ..... 57.8 ± 1.2 g/100 g Loss on Ignition..... 0.452 ± 0.093 g/100 g **Indicative Values** Magnesium (as MgO) ..... 0.080 g/100 g Manganese (as MnO)..... 0.0025 g/100 g Sodium (as Na_2O)..... 0.023 g/100 g Strontium (as SrO) .....0.18 g/100 g Titanium (as TiO_2) .....0.0066 g/100 g Arsenic ..... 0.16 mg/kg Chromium..... 4.4 mg/kg Cobalt..... 0.35 mg/kg Copper ..... 3.5 mg/kg Lead.....1.6 mg/kg Nickel.....1.9 mg/kg Vanadium.....2.6 mg/kg Zinc.....1.6 g/100 g	**75 g**

Code	Batch	Description	Unit Size
LGC2702 4005	**1**	**Blended Gypsum – Major Oxides and Trace Elements** Blended gypsum, in the form of chippings and powders, was obtained from British Gypsum (East Leake, Leicestershire, UK). The material was dried at 30 ℃ in a calibrated drying oven, then ball-milled in a cleaned 250 mL capacity agate milling vessel until the powder passed a calibrated 75 µm stainless steel sieve mesh. This reference material is intended for use in the validation of new methods, and for monitoring the performance of methods commonly used in laboratories to analyse samples of gypsum for quality control and environmental monitoring purposes. **Certified Value** Mercury .....420 ± 35 µg/kg **Assessed Values** Aluminium (as Al_2O_3) .....1.121 ± 0.038 g/100 g Calcium (as CaO) .....31.47 ± 0.65 g/100 g Iron (as Fe_2O_3).....0.392 ± 0.036 g/100 g Phosphorus (as P_2O_5)..0.0177 ± 0.0079 g/100 g Potassium (as K_2O) .....0.196 ± 0.013 g/100 g Silicon (as SiO_2) ..... 3.01 ± 0.12 g/100 g Sulfur (as SO_3) ..... 41.26 ± 0.69 g/100 g Titanium (as TiO_2) ... 0.0550 ± 0.0049 g/100 g Loss on Ignition..... 21.32 ± 0.21 g/100 g Lead .....8.4 ± 2.1 mg/kg Nickel .....4.8 ± 1.4 mg/kg Vanadium..... 10.5 ±1.5 mg/kg Zinc..... 11.7 ± 3.1 mg/kg **Indicative Values** Magnesium (as MgO) ..... 0.92 g/100 g Maganese (as MnO)..... 0.011 g/100 g Sodium (as Na_2O) .....0.031 g/100 g Strontium (as SrO) .....0.13 g/100 g Arsenic ..... 2.4 mg/kg Barium..... 43 mg/kg Chromium..... 9.0 mg/kg Cobalt..... 1.8 mg/kg Copper .....4.4 mg/kg Selenium.....5.1 mg/kg Thallium .....0.18 mg/kg	**75 g**

Code	Batch	Description	Unit Size
LGC2703 4005	**1**	**Melnik desulfurised Gypsum – Major Oxides and Trace Elements** Melnik desulfurised (DSG) gypsum, in powder form, was obtained from British Gypsum (East Leake, Leicestershire, UK). The material was dried at 30 ℃ in a calibrated drying oven. After drying the material was ball-milled in a cleaned 250 mL capacity agate milling vessel until the powder passed a calibrated 75 µm stainless steel sieve mesh. This reference material is intended for use in the validation of new methods, and monitoring the performance of methods commonly used in laboratories to analyse samples of gypsum for quality control and environmental monitoring purposes. **Certified Value** Mercury .....646 ± 42 µg/kg **Assessed Values** Aluminium (as Al_2O_3) .....0.459 ± 0.031 g/100 g Calcium(as CaO).....32.45 ± 0.86 g/100 g Iron(as Fe_2O_3).....0.142 ± 0.023 g/100 g Phosphorus (as P_2O_5)..0.0120 ± 0.0042 g/100 g Potassium (as K_2O) .....0.0340 ± 0.0075g/100 g Silicon (as SiO_2) ..... 0.90 ± 0.12 g/100 g Sulfur (as SO_3) ..... 44.84 ± 0.55 g/100 g Titanium (as TiO_2) ... 0.0325 ± 0.0046 g/100 g Loss on Ignition..... 21.21 ± 0.35 g/100 g Nickel .....3.2 ± 1.3 mg/kg Vanadium .....6.0 ± 1.8mg/kg Zinc. ……..9.5 ± 2.0 mg/kg **Indicative Values** Magnesium (as MgO) ..... 0.16 g/100 g Manganese (as MnO)..... 0.0040 g/100 g Sodium (as Na_2O) ……..0.022 g/100 g Strontium (as SrO) ……0.012 g/100 g Arsenic ..... 3.5 mg/kg Chromium..... 7.9 mg/kg Cobalt..... 0.92 mg/kg Copper ..... 2.8 mg/kg Lead. ……3.6 mg/kg Selenium ……..11 mg/kg Thallium …… 0.076 mg/kg	**75 g**

CARBON ISOTOPE RATIOS

Code	Batch	Description	Unit Size
ERM-AE672  4005	**a**	**Glycine – Absolute Carbon Isotope Ratio** The material was prepared from a single batch of commercially available high purity glycine. 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. **Certified Value** $n(^{13}C)/n(^{12}C)$ .....0.010648 ± 0.000031 (ratio) **Additional Material Data** $\delta^{13}C_{VPDB\text{-}LSVEC}$ ..... - 42.12 ± 0.42 (‰)	**0.5 g**