

Appendix E: Schedules for contamination testing

Soils General Suite

Determinand	Preferred Method	Detection Limit	Performance
SecondSite analytical methodologies are to be used where available for the determinands provided that the method complies with any MCERTS requirements that may apply.			
Moisture Content of soil (as received or after air drying)	BS 7755: Part 3: Section 3.1: 1994	0.5% absolute	Precision: 5% relative, on air-dried, ground sample
Stone content	Report percentage by weight of stones removed from the sample prior to analysis – BS 7755-3.5:1995		Precision: 0.1% on air dried sample
Soil Organic Matter	Report Soil Organic Matter content (SOM)	0.1%	
Fraction of organic carbon/Total Organic Carbon	Report Fraction of organic carbon, foc	0.001	
Asbestos identification and quantitative analysis	HSE Contract Research Paper 83/1996, method 5.2	0.01%	Precision: At 0.1% factor of 2 to 90%
Metals, as below	Extraction using Aqua Regia to BS 7755: Part 3: Section 3.9: 1995 Determination to BS 7755-3.13:1998 (cadmium, chromium, cobalt, copper, lead, manganese, nickel & zinc)	Varies, see below	MCERTS standard for all determinands
Antimony	ICP, AAS, HGAAS	1mg/kg	
Arsenic	ICP, HGAAS	5mg/kg	
Beryllium	ICP, AAS/GFAAS	1mg/kg	
Cadmium	ICP, AAS	0.5mg/kg	
Chromium	ICP (preferred), AAS	5mg/kg	
Copper	ICP, AAS	5mg/kg	
Lead	ICP, AAS	5mg/kg	
Mercury	Analysed on a separate digest - BS ISO 16772:2004	1mg/kg	
Nickel	ICP, AAS	5mg/kg	
Selenium	HGAAS, HGAFS	5mg/kg	
Tin	AAS, HGAAS	1mg/kg	
Zinc	ICP, AAS	5mg/kg	
Easily liberated Cyanide (free cyanide)	BG plc method 3.1.7 (distillation of hydrogen cyanide at pH 4, collect ion in sodium hydroxide solution, measurement as for total cyanide (BS ISO 11262:2003))	5.0mg/kg	MCERTS standard
Sulfide	EPA Test Methods for evaluating solid wastes SW846: Method 9030A for acid insoluble sulphide (treatment of sample with hydrochloric acid, distilling off H ₂ S in stream of nitrogen trapping into zinc acetate, colorimetric or titrimetric end point)	10mg/kg	MCERTS standard
Chloride	Extraction: BS 7755: Part 3: Section 3.11: Section 3 Measurement: Titration, Ion Chromatography, or equivalent	5mg/kg	Precision: 5% relative on extract, 20% on sample, on air-dried sample
SD1 basic determinands Methods used to be in accordance with Table A1 of BRE Special Digest 1: Part 1: 2003	Acid soluble sulphate as SO ₄ , water soluble sulphate (2:1 extract) as SO ₄	Acid soluble, 0.05% (50mg/kg)	MCERTS standard
	Extraction to BS 7755: Part 3: Section 3.11: Section 4 and 5. Measurement: Gravimetry, turbidity, colorimetry, ion chromatography, or equivalent method.	Water soluble, 0.01g/l	Precisions: 5% relative on extract, 20% on sample, on air-dried sample
	pH (2.5:1 extract), BS 7755: Part 3: Section 3.2: 1995.	1 to 13 pH units, to 0.1 pH	Precision: ±0.2 pH units, on air-dried sample
	Total sulfur	0.01%	Precision: 10% relative on sample oven dried at 75-80°C
Phenols screen	Phenols in waters and effluents by GLC, 4AAP and MBTH, 1981 (rev. 1988) Draft BS ISO 14154	0.2mg/kg as phenol	Precision: 15% relative, on as received sample
Total petroleum hydrocarbons	TPHCWG Method with split into aliphatics and aromatics and banding into TPHCWG Equivalent Carbon bands and reporting of BTEX and MTBE: Aliphatics: EC5-6, EC>6-8, EC>8-10, EC>10-12, EC>12-16, EC>16-21 Aromatics: EC5-7 (benzene), EC>7-8 (toluene), EC>8-10, EC>10-12, EC>12-16, EC>16-21, EC>21-35	0.1mg/kg	MCERTS standard

BRE SD1 Suite:

SD1 basic determinands	Determinand	Detection Limit	Performance
Methods used to be in accordance with Table A1 of BRE Special Digest 1: Part 1: 2003	Acid soluble sulphate as SO ₄ , water soluble sulphate (2:1 extract) as SO ₄	Acid soluble, 0.05% (50mg/kg)	MCERTS Standard
	Extraction to BS 7755: Part 3: Section 3.11: Section 4 and 5. Measurement: Gravimetry, turbidity, colorimetry, ion chromatography, or equivalent method.	Water soluble, 0.01 g/l	5% relative on extract, 20% on sample, on air-dried sample
	pH (2.5:1 extract), BS7755:Part 3: Section 3.2:1995.	1 to 13 pH units, to 0.1 pH	±0.2 pH units, on air-dried sample
	Total sulphur	0.01%	10% relative on sample oven dried at 75-80 °C

SD1 additional determinands	Determinand	Detection Limit	Performance
Methods used to be in accordance with Table A1 of BRE Special Digest 1: Part 1: 2003	Magnesium	1mg/kg	
	Ammoniacal Nitrogen	0.5mg/kg	
	Nitrate	1mg/kg	
	Chloride	5mg/kg	5% relative on extract, 20% on sample, on air-dried sample

Possible additional analyses on soil samples, to be scheduled by the Engineer

Determinand	Preferred Method	Detection Limit	Precision/Sample
	SecondSite analytical methodologies are to be used where available for the determinands provided that the method complies with any MCERTS requirements that may apply.		
SD1 additional determinands	Magnesium	1mg/kg	
	Ammoniacal Nitrogen	0.5mg/kg	
Methods used to be in accordance with Table A1 of BRE Special Digest 1: Part 1: 2003	Nitrate	1mg/kg	
	Chloride	5mg/kg	5% relative on extract, 20% on sample, on air-dried sample
Calorific Value	Adiabatic bomb calorimeter, seeded with oil if necessary to induce combustion	100kJ/kg	Air-dried sample
Elemental Sulfur	BG pic Method 3.8 (extraction with dichloromethane, measurement by HPLC with UV detection)	50mg/kg	MCERTS standard
Total Cyanide	BS ISO 11262:2003.	5.0mg/kg	15% relative, on as received sample
Diesel range organics and mineral oils	BS ISO 16703:2004 Determination of content of hydrocarbon in the range C10 to C40 by gas chromatography, including traces and interpretation. Band into C ₁₀₋₁₂ , C ₁₂₋₁₆ , C ₁₆₋₂₁ , C ₂₁₋₃₅ , C ₃₅₊ .	1mg/kg	MCERTS standard
Gasoline/Petrol range organics including BTEX and MTBE	Headspace GC FID, C ₅ to C ₁₂	0.01mg/kg	MCERTS standard
Polycyclic Aromatic Hydrocarbons (USEPA 16)	Air drying followed by extraction with hexane acetone, measurement by GC MS. Report: • Sum of the USEPA 16 PAHs • Individual concentrations of the 16 PAHs	0.005mg/kg each compound, 0.5mg/kg sum of the 16 PAHs	MCERTS standard
Volatile Organic Compounds (VOC) including BTEX, MTBE and chlorinated solvents	SW 846 Method 8260. Sample is pre-concentrated by headspace and then analysed by capillary column GC MS. Determination of target list and library search of unidentified peaks.	approximately 0.001mg/kg for each target compound, 0.01mg/kg for others.	Precision: 15% relative on sample as received Bias: 30% on sample as received
Semi-volatile Organic Compounds (SVOC)	SW 846 Method 8270. Solvent extraction followed by GC MS. Determination of target list and library search of unidentified peaks.	approximately 0.1mg/kg for each target compound, 1mg/kg for others.	Precision: 15% relative on sample as received Bias: 30% on sample as received
Polychlorinated Biphenyls	Extraction and clean-up SW 846 Method 8081. Solvent extraction followed by GC MS. Reported as 7 congeners.	0.001 to 0.01mg/kg	Air-dried sample
Phenols (speciated)	The determination of microgram and sub-microgram amounts of individual phenols in river and potable waters, 1988 (GC and LC methods), or HPLC with electrochemical detection. To be determined on as-received sample, or fixed in methanol/water for BG	0.02mg/kg as phenol	MCERTS standard

Leachate General Suite

Determinand	Preferred Method	Detection Limit	Precision
Preparation of "NRA Leachate"	Leaching test method for the assessment of contaminated land, Interim Guidance, NRA (1994)	n/a	Sample as received
Electrical Conductivity and pH	The measurement of Electrical Conductivity and the laboratory determination of pH value of natural, treated and waste waters, 1978	EC 100µS/cm pH readable to 0.1 pH units	EC 20µS/cm pH 0.2 pH units
Metals, as below	Inductively coupled plasma/Flame atomic absorption. (Graphite furnace AAS, Hydride generation AAS, or Atomic fluorescence spectrometry may be specified where greater accuracy is required.)	Varies, see below	5% relative
Arsenic		0.005mg/l	
Antimony		0.005mg/l	
Beryllium		0.005mg/l	
Cadmium		0.005mg/l	
Chromium		0.005mg/l	
Copper		0.005mg/l	
Lead		0.005mg/l	
Mercury		0.0001mg/l	
Nickel		0.01mg/l	
Selenium		0.005mg/l	
Tin		0.05mg/l	
Zinc		0.005mg/l	
Sulphate as SO ₄	Sulphate in waters, effluents and solids (2- Edition) 1988	10mg/l	5% relative
Sulphide	Sulphide in waters and effluents (Tentative methods) 1983	0.5mg/l	5% relative
Chloride	Chloride in waters, sewage and effluents, 1981	5mg/l	5% relative
Ammoniacal Nitrogen	Ammonia in waters 1981.	0.5mg/l	5% relative
Total Cyanide	Cyanide in waters, sewage and effluents, 1988	0.05mg/l	10% relative
Total Organic Carbon	Various methods allowable	For non-purgeable OC 1mg/l	
Chemical Oxygen Demand	Chemical Oxygen Demand (Dichromate Value) of polluted and waste waters, 1986 (Second Edition)	10mg/l	10% relative
Total petroleum hydrocarbons as Diesel range organics and mineral oils, and petrol range organics (BTEX and MTBE not requested for leachate samples)	GC FID	10µg/l With reporting of TPH, DRO, mineral oils, PRO, BTEX and MTBE	10% relative

Waste Classification Leachate Suites, to be scheduled by the Engineer

Determinand	Preferred Method	Detection Limit
Arsenic	Draft CEN standard two part batch test, PrEN12457-3.	0.01mg/kg
Barium		0.5mg/kg
Antimony		0.005mg/kg
Cadmium		0.005mg/kg
Chromium		0.01mg/kg
Copper		0.1mg/kg
Lead		0.05mg/kg
Mercury		0.0005mg/kg
Molybdenum		0.05mg/kg
Nickel		0.01mg/kg
Selenium		0.005mg/kg
Zinc		0.1mg/kg
Chloride		50mg/kg
Fluoride		0.5mg/kg
Sulphate as SO4		50mg/kg
Total Dissolved Solids		250mg/kg
Phenol Index		0.05mg/kg
Dissolved Organic Carbon		25mg/kg

Waters General Suite

App EDeterminand	Preferred Method	Detection Limit	Precision
	SecondSite analytical methodologies are to be used where available for the determinands provided that the method complies with any MCERTS requirements that may apply.		
Electrical Conductivity and pH	The measurement of Electrical Conductivity and the laboratory determination of pH value of natural, treated and waste waters, 1978	EC 100µS/cm pH readable to 0.05 pH units	EC 20µS/cm pH 0.2 pH units
Metals, as below	Inductively coupled plasma/Flame atomic absorption. (Graphite furnace AAS, Hydride generation AAS, or Atomic fluorescence spectrometry may be specified where greater accuracy is required.)	Varies, see below	5% relative
Arsenic		5µg/l	
Antimony		5µg/l	
Beryllium		50µg/l	
Cadmium		0.5µg/l	
Chromium		5µg/l	
Copper		5µg/l	
Lead		5µg/l	
Mercury		0.1µg/l	
Nickel		10µg/l	
Selenium		5µg/l	
Tin		50µg/l	
Zinc		5µg/l	
Sulfate as SO4	Sulphate in waters, effluents and solids (2 nd Edition) 1988	10mg/l	5% relative
Sulfide	Sulphide in waters and effluents (Tentative methods) 1983	0.5mg/l	5% relative
Chloride	Chloride in waters, sewage and effluents, 1981	5mg/l	5% relative
Ammoniacal Nitrogen	Ammonia in waters 1981.	0.5mg/l	5% relative
Total Cyanide	Cyanide in waters, sewage and effluents, 1988	50µg/l	10% relative
Total petroleum hydrocarbons as Diesel range organics and mineral oils, and petrol range organics including BTEX and MTBE	GC FID	10µg/l With reporting of TPH, DRO, mineral oils, PRO, BTEX and MTBE	10% relative
Total Organic Carbon	Various methods allowable	For non-purgeable OC 1mg/l	
Chemical Oxygen Demand	Chemical Oxygen Demand (Dichromate Value) of polluted and waste waters, 1986 (Second Edition)	10mg/l	10% relative
Biochemical Oxygen Demand	Biochemical Oxygen Demand 1981	1mg/l	15% relative