

Soils



Pedological parameters

IRMM-443-1 to IRMM-443-7 are representative for major European soil types. They are available in units of 200 g and are certified for the following pedological parameters:

- K_f of atrazine according OECD Testguideline 106
- $1/n$ of atrazine according OECD Testguideline 106
- K_f of 2,4-D according OECD Testguideline 106
- $1/n$ of 2,4-D according OECD Testguideline 106
- K_f of lindane according OECD Testguideline 106
- $1/n$ of lindane according OECD Testguideline 106
- pH in water according to ISO 10390
- pH in 0.01M CaCl_2 according to ISO 10390

Total and aqua regia leachable element content

	Certified values		
ERM-CC141 - Loam soil 24 g			
Total element content	As 9.9 ± 1.5 mg/kg	Cd 0.35 ± 0.05 mg/kg	Co 8.5 ± 0.5 mg/kg
	Cr 86 ± 8 mg/kg	Cu 14.4 ± 1.34 mg/kg	Hg 0.083 ± 0.017 mg/kg
	Mn 464 ± 18 mg/kg	Ni 26.4 ± 2.4 mg/kg	Pb 41 ± 4 mg/kg
	Zn 57 ± 4 mg/kg	As 7.5 ± 1.4 mg/kg	Cd 0.25 ± 0.04 mg/kg
Aqua regia leachable	Co 7.9 ± 0.9 mg/kg	Cr 31 ± 4 mg/kg	Cu 12.4 ± 0.9 mg/kg
	Hg 0.080 ± 0.008 mg/kg	Mn 387 ± 17 mg/kg	Ni 21.9 ± 1.6 mg/kg
	Pb 32.2 ± 1.4 mg/kg	Zn 50 ± 4 mg/kg	As 0.34 ± 0.04 mg/kg
BCR-142R - light sandy soil 50 g			
Total element content	Co 12.1 ± 0.7 mg/kg	Cu 69.7 ± 1.3 mg/kg	Hg 0.067 ± 0.011 mg/kg
	Mn 970 ± 16 mg/kg	Ni 64.5 ± 2.5 mg/kg	Pb 40.2 ± 1.9 mg/kg
Aqua regia leachable	Cd 0.249 ± 0.010 mg/kg	Pb 25.7 ± 1.6 mg/kg	Zn 93.3 ± 2.7 mg/kg
BCR-143R - Sewage sludge amended soil 50 g			
Total element content	Cd 71.8 ± 1.2 mg/kg	Co 12.3 ± 0.3 mg/kg	Cu 130.6 ± 1.5 mg/kg
	Hg 1.10 ± 0.07 mg/kg	Mn 904 ± 13 mg/kg	Ni 299 ± 5 mg/kg
	Pb 179.7 ± 2.1 mg/kg	Zn 1055 ± 14 mg/kg	Cd 72.0 ± 1.8 mg/kg
Aqua regia leachable	Cr 426 ± 12 mg/kg	Mn 858 ± 11 mg/kg	Ni 296 ± 4 mg/kg
	Pb 174 ± 5 mg/kg	Zn 1063 ± 16 mg/kg	

Rare earth elements

	Certified values		
ERM-CC690 - calcareous soil 70 g			
	Ce 49.1 ± 2.5 mg/kg	Dy 2.90 ± 0.28 mg/kg	Gd 3.2 ± 0.4 mg/kg
	La 24.4 ± 1.7 mg/kg	Nd 19.1 ± 2.2 mg/kg	Sc 7.9 ± 0.9 mg/kg
	Tb 0.50 ± 0.07 mg/kg	Sm 3.5 ± 0.4 mg/kg	Th 7.6 ± 0.8 mg/kg
	Tm 0.232 ± 0.026 mg/kg	U 1.90 ± 0.23 mg/kg	Yb 1.57 ± 0.19 mg/kg



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Joint Research Centre

Certified reference materials for sewage sludges, sediments and soils

Sewage sludges

Total and aqua regia leachable element content

	Certified values		
BCR-146R - sewage sludge (industrial origin) 50 g			
Total element content	Cd 18.8 ± 0.5 mg/kg	Co 7.39 ± 0.27 mg/kg	Cr 196 ± 7 mg/kg
	Cu 838 ± 16 mg/kg	Hg 8.6 ± 0.4 mg/kg	Mn 323 ± 7 mg/kg
	Ni 70 ± 5 mg/kg	Pb 609 ± 14 mg/kg	Zn 3060 ± 60 mg/kg
BCR-145R - sewage sludge (mixed origin) 40 g			
Total element content	Cd 18.4 ± 0.4 mg/kg	Co 6.5 ± 0.4 mg/kg	Cr 174 ± 7 mg/kg
	Cu 831 ± 16 mg/kg	Hg 8.39 ± 0.25 mg/kg	Mn 298 ± 9 mg/kg
	Ni 65.0 ± 3.0 mg/kg	Pb 583 ± 17 mg/kg	Zn 3040 ± 60 mg/kg
Aqua regia leachable	Cd 18.4 ± 0.4 mg/kg	Co 6.5 ± 0.4 mg/kg	Cr 174 ± 7 mg/kg
	Cu 831 ± 16 mg/kg	Hg 8.39 ± 0.25 mg/kg	Mn 298 ± 9 mg/kg
	Ni 65.0 ± 3.0 mg/kg	Pb 583 ± 17 mg/kg	Zn 3040 ± 60 mg/kg

Dioxins and furans

	Certified values		
ERM-CC144 - Sewage sludge 30 g			
Dioxins	D48 1.51 ± 0.16 ng/kg	D54 4.1 ± 0.9 ng/kg	D67 235 ± 16 ng/kg
	D70 79 ± 7 ng/kg	D73 3500 ± 400 ng/kg	D75 12700 ± 800 ng/kg
Furans	F83 45 ± 4 ng/kg	F94 24.8 ± 1.6 ng/kg	F114 16.9 ± 1.5 ng/kg
	F118 14.5 ± 1.6 ng/kg	F121 6.1 ± 0.8 ng/kg	F124 0.84 ± 0.29 ng/kg
	F130 5.6 ± 0.6 ng/kg	F131 62 ± 3 ng/kg	F134 6.3 ± 0.8 ng/kg
	F135 177 ± 7 ng/kg		
BCR-677 - sewage sludge 40 g			

Total and aqua regia leachable element content

	Certified values		
As 7.7 ± 0.7 mg/kg			
Total element content	Cd 14.5 ± 1.4 mg/kg	Co 6.5 ± 0.4 mg/kg	Cr 168 ± 14 mg/kg
	Cu 348 ± 18 mg/kg	Fe 32.9 ± 1.6 g/kg	Hg 5.9 ± 0.6 mg/kg
	Mn 352 ± 14 mg/kg	Mn 340 ± 13 mg/kg	Ni 91 ± 7 mg/kg
	Pb 157 ± 9 mg/kg	Ni 86 ± 6 mg/kg	Zn 0.98 ± 0.04 g/kg
Aqua regia soluble	As 7.7 ± 0.7 mg/kg	Cd 13.3 ± 0.9 mg/kg	Co 5.9 ± 0.4 mg/kg
	Cr 150 ± 11 mg/kg	Cu 346 ± 15 mg/kg	Fe 32.8 ± 1.5 g/kg
	Hg 6.1 ± 0.7 mg/kg	Mn 340 ± 13 mg/kg	Mn 340 ± 13 mg/kg
	Ni 156 ± 4 mg/kg	Pb 156 ± 7 mg/kg	Zn 0.97 ± 0.04 g/kg

Values in brackets are indicative only

Confidence in measurements
All certificates and detailed production information can be found at <https://crm.jrc.ec.europa.eu>



<https://ec.europa.eu/jrc/>

Sediments



Extractable element fractions		
		Extraction media for which values are assigned
BCR-483 sewage sludge amended soil 35 g	Cd, Cr, Cu, Ni, Pb, Zn	EDTA acetic acid calcium chloride sodium nitrate ammonium nitrate
BCR-484 sewage sludge amended (terra rossa) soil	Cd, Cr, Cu, Ni, Pb, Zn	EDTA acetic acid calcium chloride sodium nitrate ammonium nitrate
BCR-700 organic-rich soil	Cd, Cr, Cu, Ni, Pb, Zn	EDTA acetic acid

Metal species content		
	Certified values	
ERM-CC580 estuarine sediment 40 g	Total Hg 132 ± 3 mg/kg $\text{CH}_3\text{Hg} 0.075 \pm 0.004$ mg/kg	
BCR-462 coastal sediment 25 g	Tributyltin 54 ± 15 $\mu\text{g}/\text{kg}$ Dibutyltin 68 ± 12 $\mu\text{g}/\text{kg}$	
BCR-646 freshwater sediment 40 g	Tributyltin 480 ± 80 $\mu\text{g}/\text{kg}$ Dibutyltin 770 ± 90 $\mu\text{g}/\text{kg}$ Monobutyltin 610 ± 120 $\mu\text{g}/\text{kg}$ Triphenyl-tin Diphenyltin 29 ± 11 $\mu\text{g}/\text{kg}$ Monophenyl-tin 36 ± 8 $\mu\text{g}/\text{kg}$ 69 ± 18 $\mu\text{g}/\text{kg}$	

Extractable element fractions		
Certified values		
BCR-684 river sediment, 35 g	NaOH-extractable P 550 ± 21 mg/kg HCl-extractable P 536 ± 28 mg/kg Inorganic P 1113 ± 24 mg/kg Organic P 209 ± 9 mg/kg Conc. HCl-extract. P 1373 ± 35 mg/kg	
BCR-701 lake sediment, 20 g	Cd Cr Cu Ni Pb Zn	Values according to the 3-step sequential extraction procedure; in addition, indicative values for total element contents are assigned
Organic pollutants		
		Certified values
BCR-524 industrial soil 40 g	Pyrene 173 ± 11 mg/kg benz[a]anthracene 22.5 ± 1.8 mg/kg benzo[a]pyrene 8.6 ± 0.5 mg/kg benzo[e]pyrene 10.6 ± 1.4 mg/kg Benz[b]fluoranthene 13.5 ± 1.6 mg/kg Benz[k]fluoranthene 6.2 ± 0.6 mg/kg Benz [b]naphtho [2,1-d]thiophene 3.8 ± 0.6 mg/kg Indeno[1,2,3-cd] pyrene 5.1 ± 0.4 mg/kg Pentachlorophenol 0.034 ± 0.005 mg/kg	
BCR-481 industrial soil 25 g	PCB-101 37 ± 3 mg/kg PCB-118 9.4 ± 0.7 mg/kg PCB-128 9.1 ± 0.8 mg/kg PCB-149 97 ± 7 mg/kg PCB-153 137 ± 7 mg/kg PCB-156 7.0 ± 0.5 mg/kg PCB-170 52 ± 4 mg/kg PCB-180 124 ± 6 mg/kg	
BCR-529 industrial (sandy) soil 50 g	3,4-dichlorophenol 0.23 ± 0.04 mg/kg 2,4,5-trichlorophenol 1.51 ± 0.10 mg/kg Pentachlorophenol 0.23 ± 0.04 mg/kg D48 4.5 ± 0.6 $\mu\text{g}/\text{kg}$ D54 0.44 ± 0.05 $\mu\text{g}/\text{kg}$ D66 1.22 ± 0.21 $\mu\text{g}/\text{kg}$ D67 5.4 ± 0.9 $\mu\text{g}/\text{kg}$ D70 3.0 ± 0.4 $\mu\text{g}/\text{kg}$ F83 0.078 ± 0.013 $\mu\text{g}/\text{kg}$ F94 0.145 ± 0.028 $\mu\text{g}/\text{kg}$ F114 0.36 ± 0.07 $\mu\text{g}/\text{kg}$ F118 3.4 ± 0.5 $\mu\text{g}/\text{kg}$ F121 1.09 ± 0.15 $\mu\text{g}/\text{kg}$ F124 0.022 ± 0.010 $\mu\text{g}/\text{kg}$ F130 0.37 ± 0.05 $\mu\text{g}/\text{kg}$	
BCR-530 industrial (clay) soil 50 g	3,4-dichlorophenol 6.0 ± 0.5 mg/kg 2,4,5-trichlorophenol 40 ± 7 mg/kg Pentachlorophenol 0.47 ± 0.09 mg/kg Dioxins and furans: D67 0.061 ± 0.011 $\mu\text{g}/\text{kg}$ D70 0.0218 ± 0.0029 $\mu\text{g}/\text{kg}$ F94 0.24 ± 0.04 $\mu\text{g}/\text{kg}$ F114 0.62 ± 0.07 $\mu\text{g}/\text{kg}$ F118 0.321 ± 0.016 $\mu\text{g}/\text{kg}$ F121 0.186 ± 0.023 $\mu\text{g}/\text{kg}$ F130 0.126 ± 0.012 $\mu\text{g}/\text{kg}$	

Total element content		
Certified values		
BCR-277R estuarine sediment 40 g	As 18.3 ± 1.8 mg/kg Cd 0.61 ± 0.07 mg/kg Co 22.5 ± 1.4 mg/kg Cr 188 ± 14 mg/kg Cu 63 ± 7 mg/kg Hg 0.128 ± 0.017 mg/kg Ni 130 ± 8 mg/kg Se (0.58 ± 0.11) mg/kg Sn (6.5 ± 1.8) mg/kg Zn 178 ± 20 mg/kg	
BCR-280R lake sediment 40 g	As 33.4 ± 2.9 mg/kg Cd 0.85 ± 0.10 mg/kg Co 16.8 ± 0.9 mg/kg Cr 126 ± 7 mg/kg Cu 53 ± 6 mg/kg Fe 1.46 ± 0.20 mg/kg Hg 69 ± 5 mg/kg Mn (0.46 ± 0.09) mg/kg Ni (9.5 ± 1.7) mg/kg Sc 224 ± 25 mg/kg	
BCR-320R channel sediment 30 g	As 21.7 ± 2.0 mg/kg Cd 2.64 ± 0.18 mg/kg Co 9.7 ± 0.6 mg/kg Cr 59 ± 4 mg/kg Cu 46.3 ± 2.9 mg/kg Fe 25700 ± 1300 mg/kg Hg 0.85 ± 0.09 mg/kg Mn 910 ± 50 mg/kg Ni 27.1 ± 2.2 mg/kg Pb 85 ± 5 mg/kg Sc 5.2 ± 0.4 mg/kg Se (0.96 ± 0.18) mg/kg Sn (9.4 ± 1.7) mg/kg Th 5.3 ± 0.4 mg/kg Ti 0.65 ± 0.08 mg/kg U 1.56 ± 0.20 mg/kg V 46.5 ± 2.8 mg/kg Zn 318 ± 20 mg/kg	
BCR-667 estuarine sediment, 40 g	Ce 56.7 ± 2.5 mg/kg Dy 4.01 ± 0.14 mg/kg Er 2.35 ± 0.15 mg/kg Eu 1.00 ± 0.05 mg/kg Gd 4.41 ± 0.12 mg/kg Ho 0.80 ± 0.06 mg/kg La 27.8 ± 1.0 mg/kg Lu 0.325 ± 0.020 mg/kg Nd 25.0 ± 1.4 mg/kg Pr 6.1 ± 0.5 mg/kg Sc 13.7 ± 0.7 mg/kg Sm 4.66 ± 0.20 mg/kg Tb 0.682 ± 0.017 mg/kg Th 10.0 ± 0.5 mg/kg Tm 0.326 ± 0.025 mg/kg U 2.26 ± 0.15 mg/kg Yb 2.20 ± 0.09 mg/kg	

Values in brackets are indicative only.

Organic pollutants		
Certified values		
BCR-535 freshwater harbour sediment 40 g	Pyrene 2.52 ± 0.18 mg/kg Benz[a]anthracene 1.54 ± 0.10 mg/kg Benz[a]pyrene 1.16 ± 0.10 mg/kg Benz[e]pyrene 1.86 ± 0.13 mg/kg Benz[b]fluoranthene 2.29 ± 0.15 mg/kg Benz[k]fluoranthene 1.09 ± 0.15 mg/kg Indeno[1,2,3-cd] pyrene 1.56 ± 0.14 mg/kg	
BCR-536 freshwater harbour sediment 40 g	PCB-28 44 ± 5 $\mu\text{g}/\text{kg}$ PCB-52 38 ± 4 $\mu\text{g}/\text{kg}$ PCB-101 44 ± 4 $\mu\text{g}/\text{kg}$ PCB-105 3.5 ± 0.6 $\mu\text{g}/\text{kg}$ PCB-118 28 ± 3 $\mu\text{g}/\text{kg}$ PCB-128 5.4 ± 1.2 $\mu\text{g}/\text{kg}$ PCB-138 27 ± 4 $\mu\text{g}/\text{kg}$ PCB-149 49 ± 4 $\mu\text{g}/\text{kg}$ PCB-153 50 ± 4 $\mu\text{g}/\text{kg}$ PCB-156 3.0 ± 0.4 $\mu\text{g}/\text{kg}$ PCB-163 17 ± 3 $\mu\text{g}/\text{kg}$ PCB-170 13.4 ± 1.4 $\mu\text{g}/\text{kg}$ PCB-180 22 ± 2 $\mu\text{g}/\text{kg}$	

