Revision 01

Certificate of Analysis

Heavily Contaminated Sediment Reference Material

Catalog Number: EDF-5184
Lot Number: ER051603-02
Expiration Date: May 2023
Matrix: Soil
Amount per Vial: 10 g

Storage and Handling: The product contains trace amounts of dioxins/furans, PCBs, BFRs, PAHs, pesticides, and other chemical pollutants. Although metals were not analyzed as part of this interlaboratory study, it is reasonable to assume that they are present in quantities that would require special disposal considerations. This reference material should be handled according to OSHA guidelines for hazardous material. Freezer. Protect from light.

Intended Use: For laboratory use only. This product is a sample of homogeneous sedimented matrix taken from an area known to have significant chemical contamination, particularly PCBs. This sample is intended for use in evaluating the performance of an analytical laboratory for the listed analytes.

Preparation: Sediment was obtained from an EPA Superfund site in Massachusetts which was known to contain considerable contamination from PCBs and other chemical pollutants. The soil was sieved to achieve uniform particle size and homogenized to within 5% using a disodium fluorescein indicator. Samples were then sterilized three times for two hours at 121°C and 15 psi.

Interlaboratory Analysis: The product was included in the Second Round of International Laboratory Study conducted by Cambridge Isotope Laboratories and Cerilliant Corporation. Participating laboratories used a variety of sample preparation and analytical techniques. The results listed below supersede those obtained in the First Round of Interlaboratory Study. This Second Round of Interlaboratory Study adds consensus values for seventeen additional PCB congeners as well as thirteen BDE congeners, a class of compounds for which no consensus values were determined in the First Round of Interlaboratory Study.

Interlaboratory Results: Results of the international interlaboratory study are attached. Consensus values were independently assigned by Manna Associates in the UK using the Cofino model of statistical analysis. These numbers are certified reference values. All values are presented at three significant figures. Analytes with fewer than five laboratories contributing acceptable data do not have assigned values reported in this study.

Cerilliant certifies that this standard meets or exceeds the specifications stated in this data sheet.

Authorized Signature:

Darron Ellsworth, Quality Assurance Manager

March 08, 2016

Date

Interlaboratory Participants:

Alta Analytical Laboratory, USA
CARSO, France
CIEMAT (Energetic, Enviromental, & Technological Research Center), Spain
Clean Harbors Environmental Services, USA
East Bay Municipal Utility District, USA
EPFL-ENAC-ISTE-CECOTOX, Switzerland
GfA (Gesellschaft für Arbeitsplatz und Umweltanalytik) mbH, Germany
Institute for Environment and Resources, Vietnam
Institute for Chemical Technology, Czech Republic
Institute of Public Health, Czech Republic
Maxxam Analytics, Inc., Ontario Canada
Maxxam Analytics, Inc., British Columbia Canada
Military Institute of Chemicstry and Radiometry, Poland
Nab Labs Ympäristöanalytiika Oy, Finland
National Central University, Taiwan
Norwegian Institute for Air Research (NILU), Norway
Oekometric GmbH, Germany
Pace Analytical Services, Inc., USA
Research & Productivity Council (RPC), Canada
Severn Trent Laboratories, CA USA
Severn Trent Laboratories, TN USA
SGS Institut Fresenius GmbH Bayreuth, Germany
Sun Dreams Environmental Technology Corp., Taiwan
Xiamen University, China

Interlaboratory Results:

Compound	*Assigned[1] Value (ng/kg)*	*Standard Deviation*	*Reference[2] Value (ng/kg)*	*(n)[3]*
Polychlorinated dioxins and furans				
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1.96	0.55	1.96 ± 1.10	18
Total Tetrachlorodibenzo-p-dioxin	25.0	6.82	25.0 ± 13.6	9
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	5.79	1.06	5.79 ± 2.12	19
Total Pentachlorodibenzo-p-dioxin	45.8	24.6	45.8 ± 49.2	10
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	5.61	1.36	5.61 ± 2.72	19
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	10.9	1.75	10.9 ± 3.50	19
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	6.88	0.97	6.88 ± 1.94	19
Total Hexachlorodibenzo-p-dioxin	193	66.9	193 ± 134	10
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	231	38.8	231 ± 77.6	19
Total Heptachlorodibenzo-p-dioxin	497	152	497 ± 304	10
Octachlorodibenzo-p-dioxin	2,050	290	2,050 ± 580	19
2,3,7,8-Tetrachlorodibenzofuran	219	23.9	219 ± 47.8	19
Total Tetrachlorodibenzofuran	1,680	243	1,680 ± 486	9
1,2,3,7,8-Pentachlorodibenzofuran	122	12	122 ± 24.0	18
2,3,4,7,8-Pentachlorodibenzofuran	164	25.2	164 ± 50.4	19
Total Pentachlorodibenzofuran	1,490	400	1,490 ± 800	10
1,2,3,4,7,8-Hexachlorodibenzofuran	277	21.4	277 ± 42.8	18
1,2,3,6,7,8-Hexachlorodibenzofuran	159	11.8	159 ± 23.6	19
1,2,3,7,8,9-Hexachlorodibenzofuran	7.44	3.69	7.44 ± 7.38	19
2,3,4,6,7,8-Hexachlorodibenzofuran	48.4	9.37	48.4 ± 18.7	19
Total Hexachlorodibenzofuran	1,240	199	1,240 ± 398	10
1,2,3,4,6,7,8-Heptachlorodibenzofuran	346	22.8	346 ± 45.6	19
1,2,3,4,7,8,9-Heptachlorodibenzofuran	80.2	15.2	80.2 ± 30.4	19
Total Heptachlorodibenzofuran	659	231	659 ± 462	10
Octachlorodibenzofuran	301	25.3	301 ± 50.6	19

Interlaboratory Results (continued):

Compound	*Assigned [1] Value (ng/kg)*	*Standard Deviation*	*Reference [2] Value (ng/kg)*	*(n) [3]*
Polychlorinated biphenyls [4]				
2,2',5-Trichlorobiphenyl (#18)	27,600	5,620	27,600 ± 11,200	8
2,4,4'-Trichlorobiphenyl (#28)	54,200	7,750	54,200 ± 15,500	16
3,4,4'-Trichlorobiphenyl (#37)	16,800	6,350	16,800 ± 12,700	6
2,2',3,5'-Tetrachlorobiphenyl (#44)	657,000	79,400	657,000 ± 159,000	8
2,2',4,5'-Tetrachlorobiphenyl (#49)	476,000	77,700	476,000 ± 155,000	6
2,2',5,5'-Tetrachlorobiphenyl (#52)	1,340,000	130,000	1,340,000 ± 260,000	15
2,3',4,4'-Tetrachlorobiphenyl(#66)	403,000	20,400	403,000 ± 40,800	8
2,4,4',5-Tetrachlorobiphenyl (#74)	819,000	829,000	819,000 ± 1,660,000	8
3,3',4,4'-Tetrachlorobiphenyl (#77)	11,700	1,300	11,700 ± 2,600	15
3,4,4',5-Tetrachlorobiphenyl (#81)	341	201	341 ± 402	15
2,2',3,4,5'-Pentachlorobiphenyl (#87)	1,810,000	553,000	1,810,000 ± 1,110,000	6
2,2',3',4,5-Pentachlorobiphenyl (#97)	990,000	933,000	990,000 ± 1,870,000	5
2,2',4,4',5-Pentachlorobiphenyl (#99)	1,160,000	248,000	1,160,000 ± 496,000	9
2,2',4,5,5'-Pentachlorobiphenyl (#101)	3,140,000	276,000	3,140,000 ± 552,000	14
2,3,3',4,4'-Pentachlorobiphenyl (#105)	1,050,000	157,000	1,050,000 ± 314,000	19
2,3,3',4',6-Pentachlorobiphenyl (#110)	3,340,000	384,000	3,340,000 ± 768,000	8
2,3,4,4',5-Pentachlorobiphenyl (#114)	70,000	23,700	70,000 ± 47,400	17
2,3',4,4',5-Pentachlorobiphenyl (#118)	2,520,000	452,000	2,520,000 ± 904,000	17
2',3,4,4',5-Pentachlorobiphenyl (#123)	46,200	14,600	46,200 ± 29,200	16
3,3',4,4',5-Pentachlorobiphenyl (#126)	2,540	539	2,540 ± 1,080	16
2,2',3,3',4,4'-Hexachlorobiphenyl (#128)	694,000	90,500	694,000 ± 181,000	9
2,2'3,4,4',5-Hexachlorobiphenyl (#137)	164,000	53,200	164,000 ± 106,000	6
2,2',3,4,4',5'-Hexachlorobiphenyl (#138)	3,970,000	1,410,000	3,970,000 ± 2,820,000	15
2,2',3,4,5,5'-Hexachlorobiphenyl (#141)	1,010,000	173,000	1,010,000 ± 346,000	8
2,2',3,4',5,5'-Hexachlorobiphenyl (#146)	623,000	43,700	623,000 ± 87,400	5
2,2',3,4',5',6-Hexachlorobiphenyl (#149)	3,390,000	419,000	3,390,000 ± 838,000	8
2,2',3,5,5',6-Hexachlorobiphenyl (#151)	1,410,000	394,000	1,410,000 ± 788,000	8
2,2',4,4',5,5'-Hexachlorobiphenyl (#153)	3,880,000	451,000	3,880,000 ± 902,000	16
2,3,3',4,4',5-Hexachlorobiphenyl (#156)	457,000	94,700	457,000 ± 189,000	18
2,3,3',4,4',5'-Hexachlorobiphenyl (#157)	88,900	14,000	88,900 ± 28,000	16
2,3,3',4,4',6-Hexachlorobiphenyl (#158)	512,000	97,300	512,000 ± 195,000	6
2,3',4,4',5,5'-Hexachlorobiphenyl (#167)	162,000	9,380	162,000 ± 18,800	17
3,3',4,4',5,5'-Hexachlorobiphenyl (#169)	139	46.2	139 ± 92.4	16
2,2',3,3',4,4',5-Heptachlorobiphenyl (#170)	1,250,000	167,000	1,250,000 ± 334,000	11
2,2',3,3',4,5,5'-Heptachlorobiphenyl (#172)	207,000	42,800	207,000 ± 85,600	5
2,2',3,3',4',5,6-Heptachlorobiphenyl (#177)	743,000	119,000	743,000 ± 238,000	7
2,2',3,3',5,5',6-Heptachlorobiphenyl (#178)	290,000	56,600	290,000 ± 113,000	7
2,2',3,4,4',5,5'-Heptachlorobiphenyl (#180)	2,940,000	387,000	2,940,000 ± 774,000	16
2,2',3,4,4',5',6-Heptachlorobiphenyl (#183)	810,000	197,000	810,000 ± 394,000	9
2,2',3,4',5,5',6-Heptachlorobiphenyl (#187)	1,520,000	116,000	1,520,000 ± 232,000	7
2,3,3',4,4',5,5'-Heptachlorobiphenyl (#189)	50,200	9,100	50,200 ± 18,200	17
2,2',3,3',4,4',5,5'-Octachlorobiphenyl (#194)	622,000	73,200	622,000 ± 146,000	9
2,2',3,3',4,4',5,6-Octachlorobiphenyl (#195)	268,000	36,900	268,000 ± 73,800	7
2,2',3,3',4,5,5',6'-Octachlorobiphenyl (#199) [5]	691,000	113,000	691,000 ± 226,000	7
2,2',3,4,4',5,5',6-Octachlorobiphenyl (#203)	442,000	53,800	442,000 ± 108,000	6
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (#206)	152,000	17,700	152,000 ± 35,400	8
2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (#208)	31,800	5,550	31,800 ± 11,100	6
Decachlorobiphenyl (#209)	6,030	1,550	6,030 ± 3,100	9

Interlaboratory Results (continued):

Compound	*Assigned [1] Value (ng/kg)*	*Standard Deviation*	*Reference [2] Value (ng/kg)*	*(n) [3]*
Polybrominated Diphenyl Ethers [6]				
2,4,4'-Tribromodiphenyl ether (#28)	25.8	15.6	25.8 ± 31.2	12
2,2',4,4'-Tetrabromodiphenyl ether (#47)	94.7	109	94.7 ± 218	13
2,2',4,5'-Tetrabromodiphenyl ether (#49)	14.5	17.4	14.5 ± 34.8	7
2,3',4,4'-Tetrabromodiphenyl ether (#66)	32.0	55.9	32.0 ± 112	12
3,3',4,4'-Tetrabromodiphenyl ether (#77)	106	33.3	106 ± 66.6	5
2,2',3,4,4'-Pentabromodiphenyl ether (#85)	14.4	22.5	14.4 ± 45.0	12
2,2',4,4',5-Pentabromodiphenyl ether (#99)	95.1	103	95.1 ± 206	13
2,2',4,4',6-Pentabromodiphenyl ether (#100)	17.6	19.0	17.6 ± 38.0	13
2,2',3,4,4',5-Hexabromodiphenyl ether (#138)	12.2	20.3	12.2 ± 40.6	11
2,2',4,4',5,5'-Hexabromodiphenyl ether (#153)	22.4	29.7	22.4 ± 59.4	13
2,2',4,4',5,6'-Hexabromodiphenyl ether (#154)	25.3	36.9	25.3 ± 73.8	13
2,2',3,4,4',5',6-Heptabromodiphenyl ether (#183)	43.3	41.4	43.3 ± 82.8	12
Decabromodiphenyl ether (#209)	9,990	7,150	9,990 ± 14,300	9
Polyaromatic hydrocarbons				
Acenaphthene	39,300	7,420	39,300 ± 14,800	6
Acenaphthylene	419,000	154,000	419,000 ± 308,000	6
Anthracene	551,000	129,000	551,000 ± 258,000	8
Benz[*a*]anthracene	2,620,000	504,000	2,620,000 ± 1,010,000	8
Benzo[*b*]fluoranthene	1,550,000	287,000	1,550,000 ± 574,000	7
Benzo[*k*]fluoranthene	856,000	145,000	856,000 ± 290,000	8
Benzo[*g* ,*h* ,*i*]perylene	1,130,000	214,000	1,130,000 ± 428,000	8
Benzo[*a*]pyrene	2,390,000	505,000	2,390,000 ± 1,010,000	8
Benzo[*e*]pyrene [7]	1,740,000	135,000	1,740,000 ± 271,000	5
Chrysene	2,490,000	221,000	2,490,000 ± 442,000	8
Dibenz[*a* ,*h*]anthracene	243,000	79,600	243,000 ± 159,000	8
Fluoranthene	3,690,000	318,000	3,690,000 ± 636,000	8
Fluorene	69,400	38,400	69,400 ± 76,800	7
Indeno[1,2,3-*cd*]pyrene	1,320,000	390,000	1,320,000 ± 780,000	8
Naphthalene	82,900	16,900	82,900 ± 33,800	7
Phenanthrene	622,000	212,000	622,000 ± 424,000	8
Perylene [7]	428,000	235,000	428,000 ± 470,000	5
Pyrene	5,710,000	445,000	5,710,000 ± 445,000	8

[1] Assigned Value was determined by the Manna Associates in the UK using Cofino analysis of raw interlaboratory study data.

[2] Reference Value is the Assigned Value plus or minus two standard deviations. Negative numbers resulting from two standard deviations being greater than the assigned value have no significance.

[3] Number of laboratories providing results for this analyte.

[4] All numbers in parentheses refer to the IUPAC designation for the compound.

[5] This is also known as IUPAC PCB # 201.

[6] All numbers in parentheses refer to the IUPAC designation for the related PCB congener.

[7] Assigned values from the First Round of International Laboratory Study.

COA Revision History

Revision No.	Date	Reason for Revision
00	December 18, 2006	Initial version
01	March 08, 2016	Revised Expiration Date from August 2016 to May 2023.