

# Certificate of Analysis

CERTIFIED REFERENCE MATERIAL

## BNAs - Clay Loam 1

Number CRM126-100G

Lot 010572


Solvent (Matrix) Clay Loam Soil

Hazard Irritant

Storage & Handling Store at 4°C.

Expiration Date See Sample Label

Certification Date: August 18, 2010

Certified By:  Christopher Rucinski - QA Director

ISO Guide 34

Cert# AR-1470

ISO/IEC 17025

Cert# AT-1467

Analyte	Units	Certified <sup>1,4</sup> Value	k <sup>5</sup>	Standard <sup>2</sup> Deviation	Confidence Interval	Prediction Interval
1,2-Dichlorobenzene	µg/Kg	2860 ± 289	2.00	853	2580 - 3150	1100 - 4630
1,3-Dichlorobenzene	µg/Kg	2570 ± 271	2.00	801	2270 - 2860	904 - 4230
Hexachlorobutadiene	µg/Kg	1660 ± 134	2.00	397	1510 - 1810	836 - 2490
Hexachloroethane	µg/Kg	451 ± 34.2	2.00	101	408 - 494	238 - 664
Naphthalene	µg/Kg	606 ± 51.8	2.00	153	555 - 658	302 - 911
Nitrobenzene	µg/Kg	6030 ± 643	2.00	1900	5330 - 6740	2080 - 9990
1,2,4-Trichlorobenzene	µg/Kg	1570 ± 131	2.00	388	1430 - 1700	761 - 2370
Acenaphthene	µg/Kg	4250 ± 291	2.00	859	3960 - 4540	2540 - 5960
Anthracene	µg/Kg	282 ± 17.9	2.00	52.8	260 - 304	171 - 394
Benzo(a)pyrene	µg/Kg	630 ± 52.8	2.00	156	570 - 689	305 - 954
Benzo(b)fluoranthene	µg/Kg	616 ± 43.0	2.00	127	569 - 663	352 - 880
Benzo(g,h,i)perylene	µg/Kg	570 ± 42.3	2.00	125	523 - 617	310 - 831
Benzo(k)fluoranthene	µg/Kg	723 ± 58.2	2.00	172	658 - 787	365 - 1080
Benzyl alcohol	µg/Kg	7100 ± 684	2.00	2020	6290 - 7900	2850 - 11300
4-Bromophenyl phenyl ether	µg/Kg	10600 ± 829	2.00	2450	9670 - 11500	5480 - 15700
4-Chloro-3-methylphenol	µg/Kg	653 ± 55.8	2.00	165	585 - 722	305 - 1000
4-Chloroaniline	µg/Kg	581 ± 146	2.00	431	369 - 794	0.00 - 1520
2-Chloronaphthalene	µg/Kg	3890 ± 1215	2.00	3590	2380 - 5400	0.00 - 11400
2-Chlorophenol	µg/Kg	1990 ± 202	2.00	596	1780 - 2200	805 - 3180
4-Chlorophenyl phenylether	µg/Kg	8330 ± 745	2.00	2200	7490 - 9170	3730 - 12900
Chrysene	µg/Kg	2370 ± 218	2.00	645	2120 - 2620	1030 - 3710
Dibenzofuran	µg/Kg	1910 ± 135	2.00	400	1760 - 2070	1080 - 2750
Di-n-butyl phthalate	µg/Kg	2400 ± 219	2.00	646	2150 - 2660	1050 - 3760
2,4-Dichlorophenol	µg/Kg	502 ± 46.7	2.00	138	441 - 564	210 - 794

<i>Analyte</i>	<i>Units</i>	<i>Certified<sup>1,4</sup> Value</i>	<i>k<sup>5</sup></i>	<i>Standard<sup>2</sup> Deviation</i>	<i>Confidence Interval</i>	<i>Prediction Interval</i>
bis(2-Ethylhexyl) phthalate (DEHP)	µg/Kg	4880 ± 372	2.00	1100	4410 - 5360	2580 - 7190
2,4-Dinitrotoluene (2,4-DNT)	µg/Kg	875 ± 80.2	2.00	237	776 - 974	377 - 1370
Di-n-octyl phthalate	µg/Kg	1340 ± 114	2.00	338	1210 - 1480	638 - 2050
Fluoranthene	µg/Kg	124 ± 7.01	2.00	20.7	112 - 136	78.2 - 170
Fluorene	µg/Kg	1450 ± 102	2.00	300	1350 - 1550	852 - 2050
Hexachlorobenzene	µg/Kg	618 ± 38.9	2.00	115	570 - 667	375 - 861
Isophorone	µg/Kg	6120 ± 565	2.00	1670	5470 - 6780	2620 - 9620
2-Methyl-4,6-dinitrophenol	µg/Kg	3930 ± 599	2.00	1770	3180 - 4680	194 - 7660
2-Methylphenol (o-Cresol)	µg/Kg	2570 ± 245	2.00	723	2310 - 2820	1130 - 4010
3+4-Methylphenol (m+p-Cresol)	µg/Kg	3580 ± 376	2.00	1110	3160 - 4010	1270 - 5900
4-Nitrophenol	µg/Kg	5830 ± 893	2.00	2640	4860 - 6800	335 - 11300
Pentachlorophenol	µg/Kg	384 ± 31.0	2.00	91.7	344 - 424	189 - 579
Phenol	µg/Kg	738 ± 71.4	2.00	211	656 - 821	297 - 1180
2,4,5-Trichlorophenol	µg/Kg	2260 ± 228	2.00	673	2000 - 2520	859 - 3670

## Additional Information

### Sample Description

The sample size provided is 100 g of soil.

The soil has been sterilized to minimize degradation of the sample.

The sample has been sized to 100 mesh.

The sample has been intentionally prepared with an apparent headspace.

USEPA Method 8270C was the primary method for certification (GC-MS). Contact RTC for further method details.

### Storage

The sample should be stored at 4°C. It has been determined to be stable for the duration of the expiration date.

After sub-sampling replace cap securely and store remaining sample at 4°C.

The shelf life of the product was determined by historic stability of similar CRM's. The expiration date may be extended based on stock and popularity upon successful stability testing by a 17025 accredited laboratory.

Stability and shelf life after opening must be determined by the user, taking into account sampling frequency/volume and all local conditions.

### Recommended Preparation

Extract an accurately weighed portion (recommended minimum sample is 10 grams) using SW846 Method 3540C, Soxhlet Extraction; 3541, Automated Soxhlet Extraction; 3550, Ultrasonic Extraction or other technique identified by the method to be acceptable for the analytes of interest.

In addition to the solvent systems listed in Method 3540C, the methylene chloride/acetone (1:1 v/v) system is acceptable.

Note: Sample extracts and calibration solutions should be in the same solvent.

Mix well prior to sub-sampling.

Results based on a dry weight basis.

### Scope and Application

The Base Neutral Acid (BNA) Compounds in Soil Certified Reference Material (CRM) consists of a single amber glass sample jar, with a Teflon lined closure containing approximately 100 grams of soil, fortified with 41 semi-volatile organics. Being a natural matrix waste sample the analyst is challenged by the same preparation problems, analytical interferences, etc. as is typical for similar matrices received by the laboratory for analysis. Rigorous analysis identified, quantified, and certified various aliphatic and aromatic banding which are listed on the enclosed Certificate of Analysis. The sample has been analyzed by a minimum of 32 independent laboratories in a round-robin to meet the requirements specified by the ISO Guides 34 and 35, and ISO 17025.



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### Evaluation of Results

The Reference Value, 95% confidence interval (C.I.) for the Reference Value and 95% Prediction Interval (P.I.) around the Reference Value were obtained by the methods identified in the 'Scope and Application' section of this Certificate of Analysis. Samples were selected in a random fashion from the beginning to the end of the bottling sequence and sent for analysis by an independent laboratory round-robin. The data produced in the round-robin was used to calculate reference values by the USEPA EMSL-CINN's computer program "BIWEIGHT".

The generated BIWEIGHT mean, BIWEIGHT standard deviation and BIWEIGHT standard deviation of the mean are used to calculate the 95% Confidence Interval (CI) for the mean and the 95% Prediction Interval (PI). For normally distributed data, the BIWEIGHT 95% CI compares well to the classical calculation method used to generate a 95% CI. For non-Gaussian data sets, the BIWEIGHT method is more robust in data treatment.

BIWEIGHT data are also used to calculate a 95% PI. The 95% PI compares well to a 95% tolerance limit calculated using classical methods. For normally distributed data, the BIWEIGHT 95% PI typically represents approximately a  $\pm 2$  BIWEIGHT standard deviation window around the BIWEIGHT mean. Again, the BIWEIGHT method is more robust than classical methods when handling non-Gaussian data sets.

Laboratories performing the same analytical procedures on a sample whose values have been determined by the BIWEIGHT method can assume that the true mean, as determined by the method, is within the 95% CI window. Laboratories analyzing the sample should have results within the 95% PI window 19 out of 20 analyses. Laboratories should use the PI as guidance for laboratory performance.

Additional information on the program may be obtained by referring to the reference or by downloading the program from the EMSL-CINN web site. Additionally contact RTC for additional guidance - 1(307)742-5452 - support@rt-corp.com - www.rt-corp.com

### Health and Safety Information

All RTC Certified Reference Materials are intended only for professional use by properly trained laboratory personnel. This CRM has been reviewed for both health and safety and shipping risks. It is classified as non hazardous and is not classified as hazardous goods for shipping by road, sea or air transport.

A full international MSDS as a downloadable pdf file is available at [www.rt-corp.com](http://www.rt-corp.com)

- 1 Certified values are the robust statistical mean when prepared according to instructions from an Interlaboratory Study and internal rigorous testing.  
2 The standard deviation is the robust statistical standard deviation from the round robin interlaboratory study.  
4 Expanded Uncertainty (U<sub>crm</sub>) - All uncertainty values in this document expressed as  $\pm$  value are expanded uncertainties.  
5 **k**: Coverage factor derived from a t-distribution table, based on the degrees of freedom of the data set. **Confidence interval = 95%**

**TRACEABILITY:** The standard was manufactured under an ISO 17025 certified quality system. The balance used to weigh raw materials is accurate to  $\pm 0.0001$ g and calibrated regularly using mass standards traceable to NIST. All dilutions were performed gravimetrically. Additionally, individual analytes are traceable to NIST SRMs where available and specified above.

**HOMOGENEITY ASSESSMENT:** Between-bottle homogeneity was assessed in accordance with ISO Guide 35. Completed units were sampled over the course of the bottling operation. Samples were taken in the following manner: the units produced in the bottling operation were divided into three chronological groups, those from the Early third, the Middle third, and the Late third (Groups). A pre-determined number of sample units were then randomly selected from each group. A subset of each group was then randomly selected for chemical analysis. The results of the chemical analysis were then compared by Single Factor Analysis of Variance (ANOVA).

**UNCERTAINTY STATEMENT:** Uncertainty values in this document are expressed as Expanded Uncertainty (U<sub>crm</sub>) corresponding to the 95% confidence interval. U<sub>crm</sub> is derived from the combined standard uncertainty multiplied by the coverage factor k, which is obtained from a t-distribution and degrees of freedom. The components of combined standard uncertainty include the uncertainties due to characterization, homogeneity, long term stability, and short term stability (transport). The components due to stability are generally considered to be negligible unless otherwise indicated by stability studies.

THIS PRODUCT WAS DESIGNED, PRODUCED AND VERIFIED FOR ACCURACY AND STABILITY IN ACCORDANCE WITH ISO 17025 (AClass Cert AT-1467) and ISO GUIDE 34 (AClass Cert AR-1470).

MSDS reports for components comprising greater than 1.0% of the solution or 0.1% for components known to be carcinogens are available upon request.

Manufactured and certified by Sigma-Aldrich RTC, Inc.

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