



AAFCO
Association of American Feed Control Officials



Minerals Scheme

Llama and Alpaca Feed
Test Material Code # 202351

Method Summary Report
(Precision Report Follows)

Labs Reporting: 26
Methods Reported: 76
Issue Date : 04/30/2023

Method Code	Analyte and Method	Total # Labs Submitting	# Labs in Robust Calcs	Raw Mean	Raw SD	Assigned Value Robust Mean	Horwitz SD	Uncertainty (U) Robust	% RSD - Horwitz	Average Range (Rob R-bar)	Thompson Horwitz %RSD
015.43	Aluminum, ICP, Microwave (ppm)	10	10	601.1	71.72	602.7	36.79	30.81	6.10%	5.718	6.10%
015.52	Aluminum, ICP-MS, Open vessel (ppm)	2	2	552.3	17.97						
015.53	Aluminum, ICP-MS, Microwave (ppm)	2	2	612.2	26.98						
015.41	Aluminum, ICP, Dry ash (ppm)	1	1	570.8							
015.42	Aluminum, ICP, Open vessel (ppm)	1	1	596.0							
015.99	Aluminum, Miscellaneous (ppm)	1	1	524.0							
017.43	Boron, ICP, Microwave (ppm)	5	5	21.54	0.8173	21.54	2.171	0.9708	10.08%	0.7117	10.08%
017.41	Boron, ICP, Dry ash (ppm)	1	1	21.80							
017.42	Boron, ICP, Open vessel (ppm)	1	1	20.65							
017.53	Boron, ICP-MS, Microwave (ppm)	1	1	22.65							
021.43	Cobalt, ICP, Microwave (ppm)	9	9	22.55	2.739	22.63	2.264	1.215	10.00%	0.5015	10.00%
021.53	Cobalt, ICP-MS, Microwave (ppm)	4	4	22.94	1.542	22.94	2.290	1.145	9.98%	0.7950	9.98%
021.52	Cobalt, ICP-MS, Open vessel (ppm)	3	3	21.69	1.666	21.69	2.183	1.261	10.07%	1.264	10.07%
021.31	Cobalt, AAS, Dry ash (ppm)	1	1	23.09							
021.41	Cobalt, ICP, Dry ash (ppm)	1	1	20.38							
022.43	Copper, ICP, Microwave (ppm)	11	11	50.89	4.462	51.17	4.527	1.655	8.85%	0.7479	8.85%
022.52	Copper, ICP-MS, Open vessel (ppm)	3	3	48.46	4.955	48.46	4.323	2.496	8.92%	3.081	8.92%
022.53	Copper, ICP-MS, Microwave (ppm)	3	3	50.19	2.253	50.19	4.453	2.571	8.87%	1.223	8.87%
022.31	Copper, AAS, Dry ash (ppm)	2	2	35.06	19.95						
022.33	Copper, AAS, Microwave (ppm)	1	1	53.50							
022.41	Copper, ICP, Dry ash (ppm)	1	1	53.79							
022.42	Copper, ICP, Open vessel (ppm)	1	1	60.05							
022.99	Copper, Miscellaneous (ppm)	1	1	38.50							
023.01	Fluorine, Ion Sel Elect (ppm)	2	2	117.8	3.889						
024.52	Iodine, ICP-MS, Open vessel (ppm)	2	2	48.78	64.10						
034.53	Selenium, Total (Se), ICP-MS, Microwave (ppm)	9	8	0.7431	0.1265	0.7431	0.1243	0.0634	16.73%	0.0302	16.73%
034.43	Selenium, Total (Se), ICP, Microwave (ppm)	6	4	1.310	0.9500	1.310	0.2012	0.5937	15.36%	0.0372	15.36%
034.04	Selenium, Total (Se), AA, Hydride (ppm)	1	1	0.6669							
034.42	Selenium, Total (Se), ICP, Open vessel (ppm)	1	1	0.6920							

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034.52	Selenium, Total (Se), ICP-MS, Open vessel (ppm)	1	1	2.097							
036.43	Sulfur, ICP, Microwave (%)	6	6	0.3843	0.0154	0.3843	0.0177	0.0089	4.62%	0.0152	4.62%
036.42	Sulfur, ICP, Open vessel (%)	4	4	0.3910	0.0436	0.3910	0.0180	0.0090	4.61%	0.0195	4.61%
036.52	Sulfur, ICP-MS, Open vessel (%)	1	1	0.3768							
036.53	Sulfur, ICP-MS, Microwave (%)	1	1	0.3700							
036.99	Sulfur, Miscellaneous (%)	1	1	0.3935							
038.43	Molybdenum, ICP, Microwave (ppm)	8	6	4.184	0.8812	4.252	0.5471	0.4263	12.87%	0.0376	12.87%
038.53	Molybdenum, ICP-MS, Microwave (ppm)	6	6	4.331	0.2821	4.335	0.5561	0.1580	12.83%	0.4428	12.83%
038.52	Molybdenum, ICP-MS, Open vessel (ppm)	3	3	4.038	0.4528	4.132	0.5339	0.3776	12.92%	0.1132	12.92%
038.34	Molybdenum, AAS, Graphite furnace (ppm)	1	1	2.385							
038.41	Molybdenum, ICP, Dry ash (ppm)	1	1	3.850							
038.42	Molybdenum, ICP, Open vessel (ppm)	1	1	3.935							
041.43	Vanadium, ICP, Microwave (ppm)	5	5	18.25	2.777	18.25	1.886	0.8434	10.33%	0.4829	10.33%
041.53	Vanadium, ICP-MS, Microwave (ppm)	2	2	19.23	0.6657						
041.34	Vanadium, AAS, Graphite furnace (ppm)	1	1	21.70							
041.42	Vanadium, ICP, Open vessel (ppm)	1	1	18.85							
041.52	Vanadium, ICP-MS, Open vessel (ppm)	1	1	18.59							
516.53	Arsenic, Total (As), ICP-MS, Microwave (ppm)	8	8	10.33	0.8733	10.37	1.166	0.4012	11.25%	0.1819	11.25%
516.43	Arsenic, Total (As), ICP, Microwave (ppm)	7	6	9.779	0.9837	9.779	1.110	0.5693	11.35%	0.2831	11.35%
516.52	Arsenic, Total (As), ICP-MS, Open vessel (ppm)	3	3	10.79	2.376	10.79	1.207	0.6968	11.18%	0.4856	11.18%
516.42	Arsenic, Total (As), ICP, Open vessel (ppm)	1	1	10.00							
518.43	Cadmium, ICP, Microwave (ppm)	8	8	5.534	0.7864	5.591	0.6902	0.3341	12.35%	0.3357	12.35%
518.53	Cadmium, ICP-MS, Microwave (ppm)	7	7	5.769	0.2663	5.769	0.7089	0.1427	12.29%	0.2674	12.29%
518.52	Cadmium, ICP-MS, Open vessel (ppm)	3	3	5.793	0.6214	5.440	0.6744	0.4768	12.40%	0.0737	12.40%
518.31	Cadmium, AAS, Dry ash (ppm)	2	2	4.961	0.2136						
518.41	Cadmium, ICP, Dry ash (ppm)	1	1	4.457							
518.42	Cadmium, ICP, Open vessel (ppm)	1	1	5.350							
520.43	Chromium, Total (Cr), ICP, Microwave (ppm)	9	9	13.69	1.761	13.69	1.477	0.8322	10.79%	0.3792	10.79%
520.53	Chromium, Total (Cr), ICP-MS, Microwave (ppm)	5	4	11.15	5.332	11.15	1.241	0.6205	11.13%	0.3379	11.13%
520.52	Chromium, Total (Cr), ICP-MS, Open vessel (ppm)	3	3	9.056	4.610	9.056	1.040	0.6003	11.48%	0.1510	11.48%
520.31	Chromium, Total (Cr), AAS, Dry ash (ppm)	1	1	10.18							
520.41	Chromium, Total (Cr), ICP, Dry ash (ppm)	1	1	6.787							
520.42	Chromium, Total (Cr), ICP, Open vessel (ppm)	1	1	12.85							
526.43	Lead, ICP, Microwave (ppm)	8	8	1.608	0.4401	1.608	0.2394	0.2205	14.89%	0.0822	14.89%
526.53	Lead, ICP-MS, Microwave (ppm)	7	7	2.057	0.1503	2.041	0.2933	0.0623	14.37%	0.1690	14.37%
526.52	Lead, ICP-MS, Open vessel (ppm)	3	3	1.852	0.0600	1.851	0.2700	0.1559	14.58%	0.0925	14.58%
526.31	Lead, AAS, Dry ash (ppm)	2	2	1.870	0.1421						
526.41	Lead, ICP, Dry ash (ppm)	1	1	1.525							
526.42	Lead, ICP, Open vessel (ppm)	1	1	5.000							
529.99	Mercury, Miscellaneous (ppb)	9	9	1,514	834.8	1,542	231.1	367.9	14.99%	49.50	14.99%

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529.00	Mercury, Cold vapor (ppb)	1	1	2,045							
539.43	Nickel, ICP, Microwave (ppm)	8	8	12.34	1.739	12.34	1.352	0.8714	10.96%	0.5702	10.96%
539.53	Nickel, ICP-MS, Microwave (ppm)	4	4	9.705	4.460	9.705	1.103	0.5514	11.36%	0.4463	11.36%
539.52	Nickel, ICP-MS, Open vessel (ppm)	3	3	10.21	2.740	10.21	1.151	0.6647	11.28%	0.4038	11.28%
539.41	Nickel, ICP, Dry ash (ppm)	1	1	10.43							
539.42	Nickel, ICP, Open vessel (ppm)	1	1	12.60							
539.99	Nickel, Miscellaneous (ppm)	1	1	11.00							

Notes: Robust statistics not used if < 6 labs reporting. In this case Means and SD's may be reported based on Raw Data with obvious blunders removed. Robust Assigned Values indicated in bold font. Horwitz and Revised Horwitz SD's assigned regardless of participant number.



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Test Material Code # 202351

Method Precision Report

Methods Reported: 18

Labs Reporting: 26

Issue Date : 04/30/2023

Method Code	Analyte and Method	Total # Labs Submitting	# Labs used in Precision Calcs	Precision Mean	Precision SD	Between Labs sL	Within Labs sr	Reproducibility sR	Between Labs %RSD	Within Labs %rsd	Reproducibility %RSD	sR/sr
015.43	Aluminum, ICP, Microwave (ppm)	10	10	601.1	71.72	71.61	5.701	71.83	11.91%	0.95%	11.95%	12.60
017.43	Boron, ICP, Microwave (ppm)	5	5	21.54	0.8173	0.7026	0.5904	0.9177	3.26%	2.74%	4.26%	1.554
021.43	Cobalt, ICP, Microwave (ppm)	9	9	22.55	2.739	2.727	0.3591	2.751	12.10%	1.59%	12.20%	7.662
022.43	Copper, ICP, Microwave (ppm)	11	11	50.89	4.462	4.441	0.6109	4.483	8.73%	1.20%	8.81%	7.338
034.53	Selenium, Total (Se), ICP-MS, Microwave (ppm)	9	8	0.7431	0.1265	0.1253	0.0248	0.1277	16.86%	3.33%	17.18%	5.153
036.43	Sulfur, ICP, Microwave (%)	6	6	0.3843	0.0154	0.0122	0.0133	0.0181	3.19%	3.46%	4.70%	1.359
038.43	Molybdenum, ICP, Microwave (ppm)	8	6	4.184	0.8812	0.8810	0.0272	0.8814	21.06%	0.65%	21.07%	32.36
038.53	Molybdenum, ICP-MS, Microwave (ppm)	6	6	4.331	0.2821	0.1463	0.3411	0.3712	3.38%	7.88%	8.57%	1.088
041.43	Vanadium, ICP, Microwave (ppm)	5	5	18.25	2.777	2.766	0.3456	2.788	15.16%	1.89%	15.27%	8.067
516.43	Arsenic, Total (As), ICP, Microwave (ppm)	7	6	9.779	0.9837	0.9687	0.2420	0.9985	9.91%	2.47%	10.21%	4.126
516.53	Arsenic, Total (As), ICP-MS, Microwave (ppm)	8	8	10.33	0.8733	0.8653	0.1670	0.8813	8.37%	1.62%	8.53%	5.276
518.43	Cadmium, ICP, Microwave (ppm)	8	8	5.534	0.7864	0.7600	0.2858	0.8119	13.73%	5.16%	14.67%	2.841
518.53	Cadmium, ICP-MS, Microwave (ppm)	7	6	5.769	0.2663	0.1914	0.1829	0.2647	3.28%	3.14%	4.54%	1.448
520.43	Chromium, Total (Cr), ICP, Microwave (ppm)	9	9	13.69	1.761	1.745	0.3371	1.777	12.75%	2.46%	12.98%	5.273
526.43	Lead, ICP, Microwave (ppm)	8	8	1.608	0.4401	0.4373	0.0700	0.4428	27.20%	4.35%	27.55%	6.326
526.53	Lead, ICP-MS, Microwave (ppm)	7	6	2.057	0.1503	0.0477	0.0983	0.1093	2.37%	4.90%	5.44%	1.111
529.99	Mercury, Miscellaneous (ppb)	9	9	1,514	834.8	834.1	46.76	835.4	55.11%	3.09%	55.20%	17.87
539.43	Nickel, ICP, Microwave (ppm)	8	7	12.34	1.739	1.681	0.3975	1.727	13.91%	3.29%	14.29%	4.344

Notes: Precision Calculations provided for methods with 5 or more labs contributing to calculations.