Table 7. Statistical comparison of chemical analyses of standard reference waters.

[ND, not determined; MPV, most probable value; RSD, relative standard deviation; <, less than]

Lab	Anal. Method	Ref. Sample	Sample	Ca	Mg	Na	Al	As	Ba	Cd	Co	Cu	Li	Mn	Fe	Mo	Ni	Pb	Se	Sb	Sr	Tl	U	V
				mg/L			µg/L																	
USGS	ICP-MS	T-135	DL-1	9.8	1.6	30.0	<10	5	320	46	33	50	64	340	200	48	53	89	8	66	43	3	<0.005	42
USGS	ICP-MS	T-135	DL-1	9.9	1.6	30.0	<10	5	320	45	34	50	64	350	210	49	53	88	8	66	44	3	<0.005	42
USGS	ICP-MS	T-135	DL-1	9.8	1.6	30.0	<10	5	310	45	33	50	64	350	200	48	53	86	8	65	43	3	<0.005	42
USGS	ICP-MS	T-135	DL-1	9.9	1.5	30.0	<10	5	320	46	33	50	63	340	200	47	52	87	8	65	43	<0.05	<0.005	41
USGS	ICP-MS	T-135	DL-1	10.0	1.6	30.0	<10	5	320	45	33	50	64	340	200	48	52	88	8	66	43	3	<0.005	42
USGS	ICP-MS	T-135	DL-1	9.0	2.0	31.0	<10	11	61	44	38	58	62	350	140	46	59	97	12	61	44	<0.05	<0.005	49
			Mean	9.7	1.7	30.2	ND	6	275	45	34	51	64	345	192	48	54	89	9	65	43	2.0	ND	43
			Std. Dev.	0.3	0.2	0.4	ND	2.1	96	0.7	1.8	3.0	0.8	5.0	23.4	0.9	2.4	3.6	1.4	1.8	0.5	1.3	ND	2.7
		T-135[1]	**MPV**	10.4	2.0	30.8	10.5	10.0	67.8	50.5	40.0	62.0	73.7	423.0	228.0	63.0	65.6	103.0	10.0	76.3	46.0	ND	ND	52.8
		Precision	**%RSD**	**3.1**	**11.8**	**1.3**	**ND**	**35.0**	**34.9**	**1.6**	**5.3**	**5.9**	**1.3**	**1.4**	**12.2**	**1.9**	**4.4**	**4.0**	**15.6**	**2.8**	**1.2**	**65.0**	**ND**	**6.3**
		Accuracy	**% Error**	**-6.7**	**-15.0**	**-1.9**	**ND**	**-40**	**306**	**-11**	**-15**	**-18**	**-13**	**-18**	**-16**	**-24**	**-18**	**-14**	**-10**	**-15**	**-7**	**ND**	**ND**	**-19**
USGS	ICP-MS	T-137	DL-2	35.0	9.8	21.0	20	< 3	310	6	<0.02	2	8	26	45	3	13	4	<5	14	210	620	10	10
USGS	ICP-MS	T-137	DL-2	35.0	9.7	21.0	20	< 3	310	6	<0.02	1	8	25	44	4	13	4	<5	14	210	610	10	10
USGS	ICP-MS	T-137	DL-2	36.0	9.4	21.0	20	< 3	310	6	<0.02	1	8	25	41	3	13	4	<5	14	210	610	10	10
USGS	ICP-MS	T-137	DL-2	35.0	9.5	21.0	20	< 3	310	6	<0.02	2	8	26	43	4	13	4	<5	14	200	620	10	11
USGS	ICP-MS	T-137	DL-2	35.0	9.5	21.0	20	< 3	310	6	<0.02	2	8	27	44	4	13	4	<5	14	200	620	10	10
USGS	ICP-MS	T-137	DL-2	36.0	14.0	22.0	30	< 3	60	6	<0.02	2	7	41	97	3	15	4	<5	13	210	500	13	13
			Mean	35.3	10.3	21.2	22	ND	268	6	ND	2	8	28	52	3	13	4	ND	14	207	597	11	11
			Std. Dev.	0.5	1.7	0.4	3.7	0.0	93.0	0.1	ND	0.5	0.5	5.7	20.0	0.3	0.7	0.2	ND	0.4	4.7	43.5	1.1	1.1
		T-137[2]	**MPV**	38.1	10.1	22.0	30.5	0.6	65.0	6.8	0.4	1.9	8.7	98	71	8.9	15.0	6.3	ND	15.5	230	ND	10.0	14.0
		Precision	**%RSD**	**1.4**	**16.5**	**1.9**	**16.8**	**ND**	**34.7**	**1.7**	**ND**	**25.0**	**6.3**	**20.4**	**38.5**	**10.0**	**5.4**	**5.0**	**ND**	**2.9**	**2.3**	**7.3**	**10.0**	**10.0**
		Accuracy	**% Error**	**-7.3**	**2.0**	**-3.6**	**-27.9**	**ND**	**312.3**	**-11.8**	**ND**	**5.3**	**-8.0**	**-71.4**	**-26.8**	**-66.3**	**-13.3**	**-36.5**	**ND**	**-9.7**	**-10.0**	**ND**	**10.0**	**-21.4**
USGS	ICP-AES	T-135	R135A	9.2	1.8	27.1	9	ND	58	48	36	55	64	361	217	17	59	109	ND	ND	40	ND	ND	47
USGS	ICP-AES	T-135	R135B	8.8	1.8	26.2	8	ND	56	46	35	52	62	347	209	17	56	104	ND	ND	39	ND	ND	45
USGS	ICP-AES	T-135	R135C	9.0	1.8	26.9	11	ND	56	45	34	52	65	353	209	19	56	99	ND	ND	40	ND	ND	47
USGS	ICP-AES	T-135	R135D	8.1	1.7	23.9	8	ND	51	40	31	47	58	318	187	13	51	93	ND	ND	36	ND	ND	42
USGS	ICP-AES	T-135	R135E	8.5	1.7	25.0	9	ND	56	43	37	56	64	352	204	13	56	114	ND	ND	39	ND	ND	44
USGS	ICP-AES	T-135	R135F	8.3	1.6	24.3	9	ND	54	42	36	55	61	340	201	13	53	97	ND	ND	37	ND	ND	42
USGS	ICP-AES	T-135	R135G	8.7	1.8	25.2	9	ND	54	43	35	55	61	352	202	22	56	101	ND	ND	37	ND	ND	45
USGS	ICP-AES	T-135	R135H	8.1	1.6	25.0	10	ND	52	40	32	52	60	326	189	17	52	99	ND	ND	37	ND	ND	43
USGS	ICP-AES	T-135	R135I	8.5	1.7	25.5	9	ND	53	42	37	50	58	338	197	18	54	113	ND	ND	38	ND	ND	44
USGS	ICP-AES	T-135	R135J	8.7	1.8	25.8	9	ND	54	43	36	48	61	344	203	18	56	117	ND	ND	38	ND	ND	44
USGS	ICP-AES	T-135	R135K	10.0	1.7	30.0	9	ND	62	50	43	61	70	400	220	L	63	100	ND	ND	44	ND	ND	52
USGS	ICP-AES	T-135	R135L	10.0	1.8	28.0	11	ND	59	47	39	59	67	390	250	L	60	94	ND	ND	41	ND	ND	50
USGS	ICP-AES	T-135	R135M	10.0	2.0	29.0	0	ND	63	54	20	59	69	410	230	25	58	93	ND	ND	45	ND	ND	52
			Mean	8.9	1.7	26.3	9	ND	56	45	ND	54	63	356	209	15	56	103	ND	ND	39	ND	ND	46
			Std. Dev.	0.7	0.1	1.8	2.6	ND	3.6	3.9	ND	4.0	3.7	26.7	16.4	7.1	3.3	7.9	ND	ND	2.6	ND	ND	3.4
		T-135[1]	**MPV**	10.4	2.0	30.8	10.5	10.0	67.8	50.5	40.0	62.0	73.7	423	228	63.0	65.6	103.0	10.0	76.3	46.0	ND	ND	52.8
		Precision	**%RSD**	**7.4**	**5.9**	**6.7**	**29.1**	**ND**	**6.4**	**8.7**	**ND**	**7.5**	**5.9**	**7.5**	**7.9**	**47.3**	**5.8**	**7.7**	**ND**	**ND**	**6.6**	**ND**	**ND**	**7.3**
		Accuracy	**% Error**	**-14.4**	**-15.0**	**-14.6**	**-14.3**	**ND**	**-17.4**	**-10.9**	**ND**	**-12.9**	**-14.5**	**-15.8**	**-8.3**	**-76.2**	**-14.6**	**0.0**	**ND**	**ND**	**-15.2**	**ND**	**ND**	**-12.9**

Table 7. Statistical comparison of chemical analyses of standard reference waters.

[ND, not determined; MPV, most probable value; RSD, relative standard deviation; <, less than]

Lab	Anal. Method	Ref. Sample	Sample	Ca	Mg	Na	Al	As	Ba	Cd	Co	Cu	Li	Mn	Fe	Mo	Ni	Pb	Se	Sb	Sr	Tl	U	V
				mg/L			µg/L																	
USGS	ICP-AES	T-137	R137A	33.2	9.2	18.9	23	ND	56	6	ND	1	8	29	54	3	13	<8	ND	ND	200	ND	ND	12
USGS	ICP-AES	T-137	R137B	30.6	8.5	17.6	21	ND	53	5	ND	2	7	27	51	4	13	<10	ND	ND	187	ND	ND	11
USGS	ICP-AES	T-137	R137C	34.8	9.7	19.9	31	ND	59	6	ND	3	8	57	59	7	14	<13	ND	ND	211	ND	ND	14
USGS	ICP-AES	T-137	R137D	31.7	8.8	18.0	38	ND	53	6	ND	3	7	53	56	4	13	<2	ND	ND	191	ND	ND	12
USGS	ICP-AES	T-137	R137E	32.5	8.6	18.2	29	ND	57	6	ND	2	8	30	53	2	14	<4	ND	ND	195	ND	ND	12
USGS	ICP-AES	T-137	R137F	32.2	8.5	18.0	31	ND	56	5	ND	2	8	29	55	3	14	<12	ND	ND	193	ND	ND	12
USGS	ICP-AES	T-137	R137G	32.1	8.9	17.7	28	ND	54	6	ND	2	7	28	51	5	13	<7	ND	ND	187	ND	ND	12
USGS	ICP-AES	T-137	R137H	31.8	8.6	18.3	29	ND	54	6	ND	1	8	53	55	5	12	<9	ND	ND	197	ND	ND	13
USGS	ICP-AES	T-137	R137I	31.2	8.6	17.8	27	ND	52	6	ND	2	7	31	50	3	12	<11	ND	ND	187	ND	ND	11
USGS	ICP-AES	T-137	R137J	31.9	8.8	18.1	27	ND	53	6	ND	3	8	34	53	5	13	<18	ND	ND	190	ND	ND	12
USGS	ICP-AES	T-137	R137K	39.4	10.6	21.9	27	ND	66	7	ND	1	9	20	69	5	16	<12	ND	ND	230	ND	ND	14
USGS	ICP-AES	T-137	R137L	39.4	10.7	22.2	34	ND	65	7	ND	2	9	22	64	2	17	<9	ND	ND	235	ND	ND	14
USGS	ICP-AES	T-137	R137M	38.3	9.9	20.9	31	ND	66	7	ND	2	9	22	64	2	15	<8	ND	ND	226	ND	ND	13
USGS	ICP-AES	T-137	R137N	38.3	10.6	21.5	32	ND	66	7	ND	2	9	21	66	6	14	<11	ND	ND	227	ND	ND	14
USGS	ICP-AES	T-137	R137O	40.0	10.3	21.9	35	ND	63	7	ND	<10	9	20	63	6	16	<10	ND	ND	236	ND	ND	14
USGS	ICP-AES	T-137	R137P	40.5	10.7	22.3	33	ND	64	7	ND	2	9	21	64	3	15	<12	ND	ND	234	ND	ND	14
USGS	ICP-AES	T-137	R137Q	39.2	10.5	21.7	33	ND	64	7	ND	3	9	20	64	4	15	<8	ND	ND	229	ND	ND	14
USGS	ICP-AES	T-137	R137R	40.0	10.0	22.0	26	ND	67	<10	ND	<10	10	47	59	0	12	<50	ND	ND	230	ND	ND	15
			Mean	35.4	9.5	19.8	29.7	ND	59.4	5.9	ND	1.8	8.3	31.2	58.3	3.8	13.9	ND	ND	ND	210.2	ND	ND	13.0
			Std. Dev.	3.7	0.8	1.9	4.1	ND	5.5	1.5	ND	0.8	0.8	12.2	5.8	1.7	1.3	ND	ND	ND	19.3	ND	ND	1.2
		T-137[2]	**MPV**	38.1	10.1	22.0	30.5	0.6	65.0	6.8	0.4	1.9	8.7	98	71	8.9	15.0	6.3	1.3	15.5	230	ND	10.0	14.0
		Precision	**%RSD**	**10.45**	**8.42**	**9.60**	**13.80**	**ND**	**9.26**	**25.42**	**ND**	**44.44**	**9.64**	**39.10**	**9.95**	**44.74**	**9.35**	**ND**	**ND**	**ND**	**9.18**	**ND**	**ND**	**9.23**
		Accuracy	**% Error**	**-7.1**	**-5.9**	**-10.0**	**-2.6**	**ND**	**-8.6**	**-13.2**	**ND**	**-5.3**	**-4.6**	**-68.2**	**-17.9**	**-57.3**	**-7.3**	**ND**	**ND**	**ND**	**-8.6**	**ND**	**ND**	**-7.1**
Actlabs	ICP-MS	T-135	DL-1A	10.7	2.1	23.2	8	10	66	52	38	58	57	509	514	31	22	96	6	81	48	0	0	51
Actlabs	ICP-MS	T-135	DL-1 FA	9.8	2.1	23.3	8	9	64	51	34	52	57	512	426	31	20	80	7	79	47	0	0	46
Actlabs	ICP-MS	T-135	DL-1-A	9.9	2.0	24.9	9	11	68	50	39	60	67	420	261	72	58	99	10	73	46	8	0	64
Actlabs	ICP-MS	T-135	DL-1-B	10.5	0.9	23.9	8	11	68	49	39	63	69	407	255	75	60	96	10	74	46	1	0	62
Actlabs	ICP-MS	T-135	DL1A	9.5	1.3	20.1	7	9	66	49	34	45	44	329	149	68	56	91	10	84	46	0	0	47
Actlabs	ICP-MS	T-135	DL1FA	9.4	1.3	20.0	7	9	68	52	35	44	44	320	137	69	58	87	10	85	45	0	0	46
Actlabs	ICP-MS	T-135	DL-135	10.1	1.8	28.5	12	13	70	58	45	62	67	421	217	58	67	114	13	91	51	0	0	57
Actlabs	ICP-MS	T-135	JV-135	10.1	1.8	28.8	10	12	71	58	43	54	66	411	221	63	65	114	11	91	50	35	0	57
Actlabs	ICP-MS	T-135	DL-135-1	9.9	1.7	26.6	7	11	71	51	38	60	55	379	235	66	59	105	10	100	49	0	1	53
Actlabs	ICP-MS	T-135	JV 135-1	9.7	1.8	27.4	7	12	74	53	39	60	59	378	286	69	61	106	10	102	48	0	0	56
Actlabs	ICP-MS	T-135	DJV-1RA	10.5	1.8	28.3	10	12	63	53	41	63	66	408	534	83	67	109	11	99	47	0	0	57
Actlabs	ICP-MS	T-135	DL-1Y	13.4	2.5	36.6	14	15	64	48	43	85	76	470	284	78	72	98	12	95	52	0	0	66
			Mean	10.3	1.8	26.0	9	11	68	52	39	59	60	414	293	64	55	100	10	88	48	4	0	55
			Std. Dev.	1.0	0.4	4.3	2.1	1.7	3.3	3.2	3.5	10.0	9.4	58.0	124.6	15.8	15.9	10.1	1.9	9.5	2.1	9.8	0.2	6.6
		T-135[1]	**MPV**	10.4	2.0	30.8	10.5	10.0	67.8	50.5	40.0	62.0	73.7	423	228	63.0	65.6	103.0	10.0	76.3	46.0	ND	ND	52.8
		Precision	**%RSD**	**9.7**	**22.2**	**16.5**	**23.3**	**15.5**	**4.9**	**6.2**	**9.0**	**16.9**	**15.7**	**14.0**	**42.5**	**24.7**	**28.9**	**10.1**	**19.0**	**10.8**	**4.4**	**ND**	**ND**	**12.0**
		Accuracy	**% Error**	**-1.0**	**-10.0**	**-15.6**	**-14.3**	**10.0**	**0.3**	**3.0**	**-2.5**	**-4.8**	**-18.6**	**-2.1**	**28.5**	**1.6**	**-16.2**	**-2.9**	**0.0**	**15.3**	**4.3**	**ND**	**ND**	**4.2**

Table 7. Statistical comparison of chemical analyses of standard reference waters.

[ND, not determined; MPV, most probable value; RSD, relative standard deviation; <, less than]

Lab	Anal. Method	Ref. Sample	Sample	Ca	Mg	Na	Al	As	Ba	Cd	Co	Cu	Li	Mn	Fe	Mo	Ni	Pb	Se	Sb	Sr	Tl	U	V
				mg/L			µg/L																	
Actlabs	ICP-MS	T-137	DL-2A	39.1	11.3	17.7	30	<0.03	70	7	<0.005	2	9	127	329	4	6	7	<0.2	18	231	176	6	14
Actlabs	ICP-MS	T-137	DL-2 FA	34.0	10.7	16.9	28	<0.03	68	8	<0.005	2	9	128	240	4	6	6	1	18	225	148	5	13
Actlabs	ICP-MS	T-137	DL-2-A	31.0	9.6	15.9	28	1	64	7	<0.005	3	8	33	332	9	18	4	<0.2	17	243	147	9	16
Actlabs	ICP-MS	T-137	DL-2-B	32.9	8.8	14.5	28	1	63	7	1	3	8	31	275	15	18	8	1	18	236	138	8	16
Actlabs	ICP-MS	T-137	DL2A	26.5	5.5	13.8	23	<0.03	65	7	<0.005	1	5	81	143	9	15	7	<0.2	17	208	166	11	12
Actlabs	ICP-MS	T-137	DL2FA	27.8	6.2	15.0	24	<0.03	64	7	<0.005	1	6	85	158	10	15	6	1	17	216	167	10	13
Actlabs	ICP-MS	T-137	DL-137	36.8	9.4	21.0	30	1	69	8	<0.005	3	9	34	224	7	17	9	<0.2	19	241	216	0	16
Actlabs	ICP-MS	T-137	JV-137	39.0	9.9	21.8	32	1	71	8	<0.005	3	10	37	239	9	18	9	1	20	244	212	0	16
Actlabs	ICP-MS	T-137	DL-137-2	36.3	9.5	21.4	26	<0.03	73	7	<0.005	2	8	35	332	4	16	5	<0.2	22	241	201	11	14
Actlabs	ICP-MS	T-137	JV-137-2	36.3	10.1	22.9	26	1	74	7	<0.005	2	8	38	358	6	17	6	<0.2	21	251	193	11	17
Actlabs	ICP-MS	T-137	DJV-2RA	36.5	9.6	21.0	28	1	59	6	<0.005	2	9	35	552	6	18	5	<0.2	20	228	186	11	16
Actlabs	ICP-MS	T-137	DL-2X	45.3	0.0	17.3	49	1	63	7	<0.005	4	7	48	460	9	22	5	1	21	257	161	11	19
			Mean	35.1	8.4	18.3	29	ND	67	7	ND	2	8	59	304	8	15	6	ND	19	235	176	8	15
			Std. Dev.	4.9	3.0	3.1	7	ND	4	1	ND	1	1	35	113	3	5	1	ND	2	14	25	4	2
		T-137[2]	**MPV**	38.1	10.1	22.0	30.5	0.6	65.0	6.8	0.4	1.9	8.7	98	71	8.9	15.0	6.3	ND	15.5	230	ND	10.0	14.0
		Precision	**%RSD**	**13.96**	**35.71**	**16.94**	**22.76**	**ND**	**5.97**	**14.29**	**ND**	**50.00**	**12.50**	**59.32**	**37.17**	**37.50**	**33.33**	**16.67**	**ND**	**10.53**	**5.96**	**14.20**	**50.00**	**13.33**
		Accuracy	**% Error**	**-7.9**	**-16.8**	**-16.8**	**-4.9**	**ND**	**3.1**	**2.9**	**ND**	**5.3**	**-8.0**	**-39.8**	**328.2**	**-10.1**	**0.0**	**-4.8**	**ND**	**22.6**	**2.2**	**ND**	**-20.0**	**7.1**

Statistical analysis of variance among laboratories using ICP-MS

Reference Sample	Lab	Ca	Mg	Na	Al	As	Ba	Cd	Co	Cu	Li	Mn	Fe	Mo	Ni	Pb	Se	Sb	Sr	Tl	U	V
		mg/L			µg/L																	
T-135	**ACTLABS**	10.3	1.8	26.0	9.0	11.0	68	52.0	39.0	59.0	60.0	414	293.0	64.0	55.0	100.0	10.0	88.0	48.0	4.0	0.0	55.0
	USGS	9.7	1.7	30.2	ND	6.0	275	45.0	34.0	51.0	64.0	345	192.0	48.0	54.0	89.0	9.0	65.0	43.0	2.0	ND	43.0
	% ERROR	**6.2**	**5.9**	**-13.9**	**ND**	**83.3**	**-75**	**15.6**	**14.7**	**15.7**	**-6.3**	**20**	**52.6**	**33.3**	**1.9**	**12.4**	**11.1**	**35.4**	**11.6**	**100.0**	**ND**	**27.9**
T-137	**ACTLABS**	35.1	8.4	18.3	29.0	ND	67	7.0	ND	2.0	8.0	59	304.0	8.0	15.0	6.0	ND	19.0	235.0	176.0	8.0	15.0
	USGS	35.3	10.3	21.2	22.0	ND	268	6.0	ND	2.0	8.0	28	52.0	3.0	13.0	4.0	ND	14.0	207.0	597.0	11.0	11.0
	% ERROR	**-0.6**	**-18.4**	**-13.7**	**31.8**	**ND**	**-75**	**16.7**	**ND**	**0.0**	**0.0**	**111**	**484.6**	**166.7**	**15.4**	**50.0**	**ND**	**35.7**	**13.5**	**-70.5**	**-27.3**	**36.4**

[1] Long and Farrar, 1995

[2] Anonymous, 1996