DUBAI ACCREDITATION DEPARTMENT

REPORT ON PTP 183 INTER-LABORATORY PROFICIENCY TESTING PROGRAM DETERMINATION OF DRINKING WATER ANALYSIS USING ULTRACHECK™ QUALITY CHECK SAMPLES

Date: 27 December 2009

1. INTRODUCTION

This document presents the results of the 183 inter-laboratory proficiency testing program conducted during the month of December involving the analysis of quality check samples for drinking water analysis using **Ultra check™ Quality Check Samples** with thirteen (13) participating laboratories.

This program is part of the Inter-laboratory Comparison Programs organized by Dubai Accreditation Department (DAC) of Dubai Municipality (DM) for monitoring the validity of test results of laboratories operating in Dubai as a requirement of the Local Order 52/1990 and ISO/IEC 17011: 2004.

2. EXPERIMENTAL DESIGN

2.1 Participants:

Thirteen laboratories participated in this program. eleven of them are private laboratories and one is governmental are accredited by DAC for environmental waste water analysis, drinking water analysis and other scopes, also one of the participants is one the applicants for accreditation.

2.2 Samples tested:

The following samples were distributed:

2.2.1 ULTRA Check ® Trace Metals #1 QC Sample Catalog No. QCI-705 A

This ULTRA Check ® sample was gravimetrically prepared and the analysis concentrations were confirmed using the analytical technique listed in the certificate attached with this report. The reference value represents the determined value when the sample has been prepared according to instruction.

2.2.2 ULTRA Check (™) Minerals Sample - Catalog No. QCI-710

This ULTRA Check (™) sample was gravimetrically prepared and the analysis concentrations were confirmed using the analytical technique listed in the certificate attached with this report. The reference value represents the determined value when the sample has been prepared according to instruction.

2.2.3 ULTRA Check (™) Water Hardness Sample - Catalog No. QCI-720

This ULTRA Check (™) sample was gravimetrically prepared and the analyte concentrations were confirmed using the analytical technique listed in the certificate attached with this report. The reference value represents the determined value when the

sample has been prepared according to instruction.

2.2.4 ULTRA Check ® Corrosivity QC Sample Catalog No. QCI-717

This ULTRA Check (™) sample was gravimetrically prepared and the analyte concentrations were confirmed using the analytical technique listed in the certificate attached with this report. The reference value represents the determined value when the sample has been prepared according to instruction.

2.3 Sample preparation:

Sample preparation is as per the enclosed ULTRAcheck instructions.

3. CONFIDENTIALITY

Each laboratory is given a code number to maintain confidentiality of results and to protect their identities. Only the concerned laboratory knows its code number.

4. TEST METHOD

Instructions were given to the participants to test the samples as per the appropriate test method applied by the laboratory.

5. TEST RESULTS

5.1 Upon receipt of the test results from the participating laboratories, the sealed envelopes containing the Certificate of Analysis of the samples distributed were opened. The certified "Assigned value" and "Advisory Range" as given in the Certificates are shown in the first half of Appendix A. Copies of the Certificates of Analysis are given in the Appendix B.

5.2 The test results submitted by the participating laboratories are given in the second half of Appendix A. In order to protect the identities of the participating laboratories, each one was assigned a code number.

5.3 Appendix A also indicates whether the participating laboratory's results are within (Pass) or outside (Fail) the "Advisory Range".

5.4 The inter-laboratory comparisons is based on the number of parameters which are tested by the participants, however, pass/fail results which are highlighted in yellow color are calculated as per the number of parameter reported by the participant.
Only two participants were reported all the 30 parameters mentioned the four certificates the other participants were reported less parameter one laboratory was reported only 5 parameters. The number of the parameters which were reported by the participants reflects their testing capability.

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6. EVALUATION OF RESULTS

Outliers Results

CRM No.	Test Parameter	Labs with Outlier Results
QCI - 720	Calcium	Lab G02; Lab 22
	Magnesium	Lab G02; Lab 4; Lab 22; Lab 23; Lab 37
	Total Hardness (as CaCO3)	Lab 22
QCI - 717	Alkalinity (as CaCO3)	Lab G02; Lab 4; Lab 9; Lab 22; Lab 23; Lab 37; Lab 49; Lab 79
	Calcium Hardness (as CaCO3)	Lab 23
	Total Filterable Residue	Lab G02; lab 2; Lab 4; Lab 9; Lab 19; Lab 22; Lab 23; Lab 28; Lab 37; Lab 58; Lab 79
	Sodium	Lab G02; Lab 2; Lab 9; Lab 37
QCI - 710	Alkalinity (CaCO3)	Lab 19; Lab 22
	Conductivity @ 25^{O}C	Lab IN02; Lab 2; Lab 4; Lab 9; Lab 19; Lab 23; Lab 37; Lab 49; Lab 79
	PH	Lab 49
	Chloride	Lab G02; Lab 4; Lab 19; Lab 23; Lab 28; Lab 37; Lab 58; Lab 79
	Fluoride	Lab 4; Lab 19
	Sulfate	Lab 28
	Nitrate as N	Lab 4; Lab 19; Lab 23; Lab37; Lab79
	Sodium	Lab 19
	Potassium	Lab 23; Lab 37
QIC – 705A	Arsenic - As	LabG02; lab 23; Lab 37
	Cadmium - Cd	Lab 23
	Nickel - Ni	Lab 28
	Selenium - Se	Lab 23
	Vanadium - V	Lab 19; Lab 23; Lab37

The test results provided by the above mentioned laboratories are outside the advisory limits. The above mentioned laboratories are requested to investigate the root cause of the outlier results, implement corrective action and a report shall be available upon need by the assessment team during the nearest assessment visit.

7. APPENDICES

7.1 Appendix A: Summary of results

7.2 Appendix B: CRM Certificates

7.2.1 ULTRA Check ® Trace Metals #1 QC Sample Catalog No. QCI-705 A

7.2.2 ULTRA Check (™) Minerals Sample - Catalog No. QCI-710

7.2.3 ULTRA Check (™) Water Hardness Sample - Catalog No. QCI-720

7.2.4 ULTRA Check ® Corrosivity QC Sample Catalog No. QCI-717

---- End of Report ---

S. No.	Parameters	Assigned/Reference Value	Advisory Range	Lab 49	Lab 9	Lab 2	Lab 58	Lab 19	Lab 23	Lab 28	Lab 79	Lab 4	Lab G02	Lab 22	Lab IN02	Lab 37
1	Calcium	148 ± 1 mg/L	133 – 162	144.2	148	148	*	157	158.68	*	146	153	360	514	152.8	142
2	Magnesium	33.1 ± 0.3 mg/L	29.8 – 36.4	34.7	34	33	*	31	28	*	31.14	28.7	140	149.3	33.4	37
3	Total Hardness (as CaCO3)	505 ± 5 mg/L	454 – 555	503	510	504	*	520	512	*	493	500	500	34.4	519	505
4	alkalinity (as CaCO3)	32.9 ± 0.3 mg/L	29.6 – 36.8	37.4	38	34	*	31.1	38	*	42	45	38	49.3	36	39
5	calcium hardness (as Caco3)	174 ± 2 mg/L	155 – 192	158.2	168	168	*	161	196	*	164	180	172	170	188	189
6	PH	9.11 ± 0.01 mg/L	8.91 – 9.31	8.62	9.00	8.90	9.10	9.00	8.90	9.00	9.10	9.20	9.02	8.92	9.12	9.10
7	total filterable residue	268 ± 22 mg/L	176 – 359	312	480	500	410	496	406	410	392	450	430	444	350	439
8	Sodium	15.1 ± 0.2 mg/L	13.3 – 16.7	16.05	20	18	*	15.1	14.7	*	*	16.2	18.4	15.07	15.2	25
9	Alkalinity (CaCO3)	226 ± 2 mg/L	203 – 248	245	245	214	*	122	220	*	244	220	227	253	210	241
10	Conductivity @ 25°C	510 ± 2 µmhos/cm	476 – 544	560	550	550	*	551	550	*	568	550	527	504	553	551
11	PH	9.10 ± 0.01	8.9 – 9.3	8.84	9.10	9.10	9.10	9.21	9.10	9.10	9.10	9.18	9.10	9.08	9.21	9.15
12	Chloride	14.6 ± 0.2 mg/L	12.8 – 17.4	14.8	15	14	20	18.4	18	20	21	11	12	15.3	16.7	10.8
13	Fluoride	6.23 ± 0.07 mg/L	5.61 – 6.85	6.25	*	6.4	*	< 0.1	5.8	*	5.95	7.94	6.62	6.2	5.99	6.01
14	Sulfate	36.9 ± 0.8 mg/L	32 – 40.8	35.3	40	36	40	39	40	31	36	40	37	40	36.1	34.1
15	Nitratee as N	2.06 ± 0.01 mg/L	1.75 – 2.36	1.98	2.00	2.00	*	< 0.1	1.3	*	1.0	8.2	*	1.8	2.00	1.69
16	Sodium	118 ± 0.3 mg/L	106 – 129	120.4	120	*	*	100	122	*	*	109	120	125	108.6	111
17	Potassium	28.7 ± 0.1 mg/L	25.4 – 32.4	28.6	*	*	*	30	51.69	*	*	31.5	29.8	27.44	29.5	51
18	Aluminium -Al	3000 ± 30 µg/L	2648–3312	*	*	3132	*	2840	3131	*	*	*	3030	2670	3000	2952.0
19	Arsenic– As	200 ± 2 µg/L	177 – 224	*	*	200	*	*	235	*	*	*	610	*	200	248.1
20	Cadmium – Cd	200 ± 2 µg/L	180 – 220	216	200	209	*	200	227	211	210	204	210	195	200	202.0
21	Chromium – Cr	1000 ± 10 µg/L	900 –1100	*	980	976	*	1030	1031	997	1011	1021	1000	984	1000	911.4
22	Cobalt – Co	500 ± 5 µg/L	450 – 550	*	510	549	*	510	546	508	531	520	520	512	500	490.4
23	Copper – Cu	800 ± 8 µg/L	720 – 880	812	780	770	*	860	829	813	792	824	800	794	810	802.2
24	Iron – Fe	2000 ± 20 µg/L	1800–2200	2009	1940	1850	*	1890	2107	2065	2026	2072	2060	2040	2130	2200.6
25	Lead – Pb	2000 ± 20 µg/L	1800–2200	2011	1950	1894	*	2030	2091	2080	2018	1945	1990	1980	1950	1942.2
26	Manganese - Mn	3000 ± 30 µg/L	2700–3300	*	*	*	*	*	3189	2980	3076	3006	3080	2949	3200	2813.1
27	Nickel – Ni	100 ± 1 µg/L	89 – 110	*	90	102	*	100	107	< 120	101	96	100	90	100	90.2
28	Selenium– Se	2000 ± 20 µg/L	1714–2200	*	*	1908	*	*	2284	*	*	*	2030	2101	1910	1963.4
29	Vanadium - V	150 ± 2 µg/L	135 – 165	*	*	147	*	170	133	*	*	*	150	152	*	102.0
30	Zinc – Zn	200 ± 2 µg/L	180 – 224	205	190	207	*	190	191	197	207	212	200	196	200	206.8
The first number is the outlier parameters, the second is the parameters determined by the laboratory out of 30 in the CRM				2/22	4/23	3/27	2/5	8/27	12/30	4/14	5/23	7/26	7/29	6/29	1/29	10/30

* the parameters which are not determined by the laboratories

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Certificate of Analysis

ULTRAcheck® Trace Metals #1 QC Sample

Catalog Number: QCI-705A

Code Number: 75036

This ULTRAcheck® sample was gravimetrically prepared, and the analyte concentrations were confirmed using the analytical technique listed. Concentrations are traceable to the NIST standard reference materials (SRMs) listed. The reference value represents the determined value when the sample has been prepared according to instructions.

Analyte	Assigned Value		Analytical Method	NIST SRM	Advisory Range
aluminum	3000 ± 30	µg/L	ICP	3171a	2648 - 3312
arsenic	200 ± 2	µg/L	ICP	3103a	177 - 224
cadmium	200 ± 2	µg/L	ICP	3171a	180 - 220
chromium	1000 ± 10	µg/L	ICP	3112a	900 - 1100
cobalt	500 ± 5	µg/L	ICP	3113	450 - 550
copper	800 ± 8	µg/L	ICP	3114	720 - 880
iron	2000 ± 20	µg/L	ICP	3171a	1800 - 2200
lead	2000 ± 20	µg/L	ICP	3128	1800 - 2200
manganese	3000 ± 30	µg/L	ICP	3132.0	2700 - 3300
nickel	100 ± 1	µg/L	ICP	3136	89 - 110
selenium	2000 ± 20	µg/L	ICP	3149	1714 - 2200
vanadium	150 ± 2	µg/L	ICP	3165	135 - 165
zinc	200 ± 2	µg/L	ICP	3168a	180 - 224

* Calculated from the NELAC Non-Potable Water Fields of Testing Document, effective 1/1/09.

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401-294-9400 Fax: 401-295-2330
www.ultrasci.com

See Reverse For Additional Information

William J. Leary
Quality Assurance Manager

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Certificate of Analysis

Minerals Sample

Catalog Number: QCI-710

Code Number: 77133

This ULTRAcheck(TM) sample was gravimetrically prepared, and the analyte concentrations were confirmed using the analytical technique listed. Concentrations are traceable to the NIST standard reference materials (SRMs) listed. The reference value represents the determined value when the sample has been prepared according to instructions.

Test	Reference Value		Analytical Method	NIST Traceability	Advisory Range*
Alkalinity (CaCO3)	226 ± 2	mg/L	EPA Method 310.1	84j	203 - 248
Conductivity @ 25°C	510 ± 2	µmhos/cm	EPA Method 120.1	3193	476 - 544
pH	9.10 ± 0.01		EPA Method 150.1	185g, 187c	8.90 - 9.30
Chloride	14.6 ± 0.2	mg/L	Mohr Titration	N/A	12.8 - 17.4
Fluoride	6.23 ± 0.07	mg/L	EPA Method 340.1	3183	5.61 - 6.85
Sulfate	36.9 ± 0.8	mg/L	EPA Method 375.4	3181	32.0 - 40.8
Nitrate as N	2.06 ± 0.01	mg/L	EPA Method 353.2	3185	1.75 - 2.36
Sodium	118 ± 0.3	mg/L	EPA Method 200.7	3152	106 - 129
Potassium	28.7 ± 0.1	mg/L	EPA Method 200.7	3141	25.4 - 32.4

* Calculated from the NELAC Non-Potable Water Fields of Testing Document, effective 1/1/09.

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William J. Leary
Quality Assurance Manager

ULTRA SCIENTIFIC
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Certificate of Analysis

Water Hardness Sample

Catalog Number: QCI-720

Code Number: 77000

This ULTRAcheck™ sample was gravimetrically prepared, and the analyte concentrations were confirmed using the analytical technique listed. Concentrations are traceable to the NIST standard reference materials (SRMs) listed. The reference value represents the determined value when the sample has been prepared according to instructions.

Test	Reference Value		Analytical Method	NIST Traceability	Advisory Range*
Calcium	148 ± 1	mg/L	ICP	3109a	133 - 162
Magnesium	33.1 ± 0.3	mg/L	ICP	3131a	29.8 - 36.4
Total Hardness (as CaCO3)	505 ± 5	mg/L	ICP	3109a & 3131a	454 - 555

* Calculated from the NELAC Non-Potable Water Fields of Testing Document, effective 1/1/09.

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See Reverse For Additional Information

William J. Leary
Quality Assurance Manager

ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

ULTRAcheck® Corrosivity QC Sample

Catalog Number: QCI-717

Code Number: 75013

This ULTRAcheck® sample was gravimetrically prepared, and the analyte concentrations were confirmed using the analytical technique listed. Concentrations are traceable to the NIST standard reference materials (SRMs) listed. The reference value represents the determined value when the sample has been prepared according to instructions.

Analyte	Assigned Value		Analytical Method	NIST SRM	Advisory Range*
alkalinity (as CaCO3)	32.9 ± 0.3	mg/L	EPA Method 310.1	84j	29.6 - 36.8
calcium hardness(as CaCO3)	174 ± 2	mg/L	ICP	3109	155 - 192
pH	9.11 ± 0.01	units	EPA Method 150.1	185g, 187c	8.91 - 9.31
total filterable residue	268 ± 22	mg/L	EPA Method 160.1	gravimetric	176 - 359
sodium	15.1 ± 0.2	mg/L	ICP	3152	13.3 - 16.7

* Calculated from the NELAC Drinking Water Fields of Testing Document, effective 1/1/09.

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