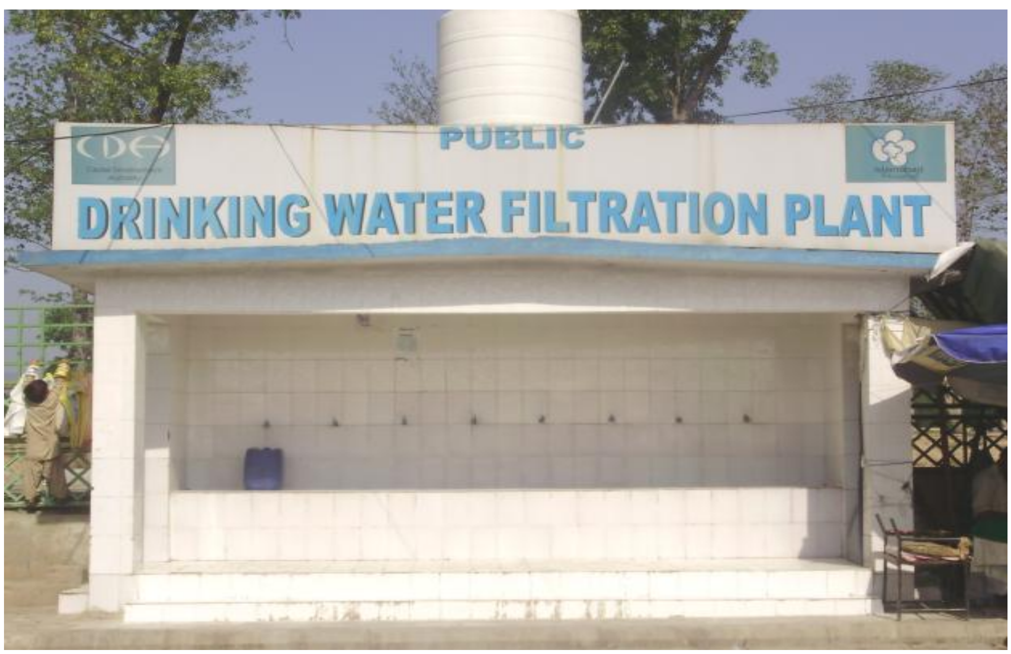
MONITORING REPORT

WATER QUALITY OF FILTRTAION PLANTS INSTALLED IN ISLAMABAD BY CDA



PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science & Technology
Khyban-e-johar, H-8/1, Islamabad.
www.pcrwr.gov.pk

(July, 2013)

INTRODUCTION

Drinking water quality has become a serious problem due to outdated infrastructure of water supply schemes, breakage in distribution system, inadequate technical capacity of water supply agencies, lack of awareness on quality issues, improper disposal of municipal, industrial and hospital solid waste and waste water. The excessive use of pesticides, insecticides and herbicides, unprotected water sources and intermittent water supply is aggravating the situation. The water shortage and increasing competition for multiple uses is another factor which has adversely affected the quality of water. Deteriorated water quality due to contamination of surface and groundwater has resulted in the increase of waterborne diseases and other health impacts.

Access to safe drinking water in Pakistan is a critical health issue that will increase with projected population growth. Estimates indicate that about 200,000 child deaths occur each year in Pakistan due to water-borne diseases. Considering the severe water pollution, around 40% of all reported diseases and deaths are attributed to poor water quality. Recent estimates exhibit that water, sanitation and hygiene diseases cost Rs.112 billion annually to the economy, more than Rs 300 million per day in terms of health costs and loss of income. The costs associated with diarrheal diseases alone are estimated in the range of Rs.55 to Rs.80 million per year (Pakistan Economic Survey, 2010-11). Infectious diseases caused by pathogenic bacteria, viruses and protozoan parasites are among the most common and widespread health risk of drinking water. Without addressing the prevailing water quality issues, the public health status cannot be improved.

Safe water concerns have been highlighted intensely in last few years and many water purification technologies have been introduced in the country to remove undesirable chemicals, materials, and biological contaminants from raw water. However; water that is reasonably contaminant free, one moment, can become dangerously contaminated, the next moment, because of accident, neglect, or some natural calamity. Usually, the general water treatment options in practice to produce safe drinking water are Rapid Sand filters, Micro-filtration, Ultraviolet disinfection and Chlorination.

Federal, provincial and local governments in Pakistan have installed many water filtration plants all over the country to provide safe drinking water to public. Sustainable supply of safe drinking water through these water filtration plants is an important issue as the efficacy of providing safe drinking water from these plants is dependent on operation and maintenance, capacity of plant operators and water quality monitoring.

Pakistan Council of Research in Water Resources (PCRWR) was designated as focal agency for water quality monitoring on 6th July, 2005. To ensure the provision of safe drinking water to the people, PCRWR is implementing several water quality monitoring programs throughout the country. The ***Filtration Plants Performance Evaluation*** is an integral part of PCRWR water quality monitoring programs. From time to time, PCRWR monitors the quality of water filtration plants installed by different agencies to ensure the health and safety of general public. An intensive performance evaluation of filtration plants installed in Capital Development Authority(CDA) is conducted in the month of July, 2013 and based on technical data; this report is compiled indicating water quality status of water filtration plants of Islamabad as well as highlighted the needs for improvement. This performance evaluation is aimed to remind the CDA about following to initiate the required measures:

- **Population Impact**: 1.15 million people receive some or all of their drinking water from the CDA's filter plants.

- **Disease Prevention:** A treatment breakdown at a filteration plant presents a widespread acute health threat from a waterborne disease outbreak. A disease outbreak can have a devastating

impact on a community. Disease prevention saves lives and millions of rupees in expenses would incur in response to an outbreak.

- **Economy**: The availability of safe public drinking water plays a critical role in the country’s economic engine. Filter plants serve drinking water to large urban areas and small rural communities and thus are a vital part of CDA’s infrastructure; they represent an essential service to general public.

- **Regulatory and Technical Complexities**: Filter plants are affected by some of the most complex regulations and involve complicated treatment processes. PCRWR’s filtration plants performance evaluation program aims to help suppliers in overcoming numerous on-going compliance challenges.

PCRWR SAMPLING METHODOLOGY

<table>
<tr><td>Plants installed in Islamabad by CDA</td><td>33</td></tr>
<tr><td>Plants Monitored</td><td>28</td></tr>
<tr><td>Reasons of un-monitored filtration plant(s)</td><td>I. A filtration plant installed in I/10-2 was found damaged.
II. Filtration plants installed in sector G-6/1-2 and G-6/2 were without taps and thus un-operational.
III. Filtration plants installed in sector G-8/1 and G-7/2 were not operational.</td></tr>
<tr><td>Composition of Sampling Team</td><td>Sampling team comprised of well experienced technical professionals i.e. A Research Officer and a Laboratory Technician from ISO-17025 accredited National Water Quality Laboratory of PCRWR.</td></tr>
<tr><td>Objectives of the Programme</td><td>1 To evaluate the quality of drinking water being supplied to general public by CDA water filtration plants
2 To highlight the need of further improvements in water treatment process and water quality monitoring on routine basis.
3 To safeguard the public health against contaminated drinking water.</td></tr>
<tr><td>Sampling Procedure</td><td>Following the American Public Health Association Protocols for water sampling, testing and quality control, water samples were collected from each filtration plant. For this purpose, four types of samples were collected from each site, preserved and transported to National water Quality Laboratory. Types of the water samples collected for performance evaluation are as following;
<table>
<tr><th>Sample Type</th><th>Preservative</th><th>WQ Parameters</th></tr>
<tr><td>Type A</td><td>Sterilized sampling bottles for microbiological analysis</td><td>Total Coliforms, Faecal Coliforms & E-coli (indicator organisms)</td></tr>
<tr><td>Type B</td><td>2ml/liter HNO_3 as preservative for trace elements</td><td>Metals and heavy metals like arsenic, lead, mercury, zinc, chromium, copper</td></tr>
<tr><td>Type C</td><td>1ml/100ml boric acid as preservative</td><td>Nitrate (N)</td></tr>
<tr><td>Type D</td><td>No preservative</td><td>Physical and aesthetic parameters. Major Cations and anions</td></tr>
</table>
Field blank and replicate samples[1] for quality control purpose were also collected. One out of ten sites was selected for replicate and field blank samples, which were analyzed to evaluate the reproducibility of analytical results and the quality of distilled water .</td></tr>
</table>

[1] **Field Blank** is a blank solution (Deionized water) that is subjected to all aspects of sample collection, field processing, preservation, transportation, and laboratory handling as an environmental sample.

Replicate Samples is a group of samples, collected in a manner that the samples are thought to be essentially identical in composition.

Water Sampling from CDA Filtration Plants by PCRWR Professionals (July, 2013)

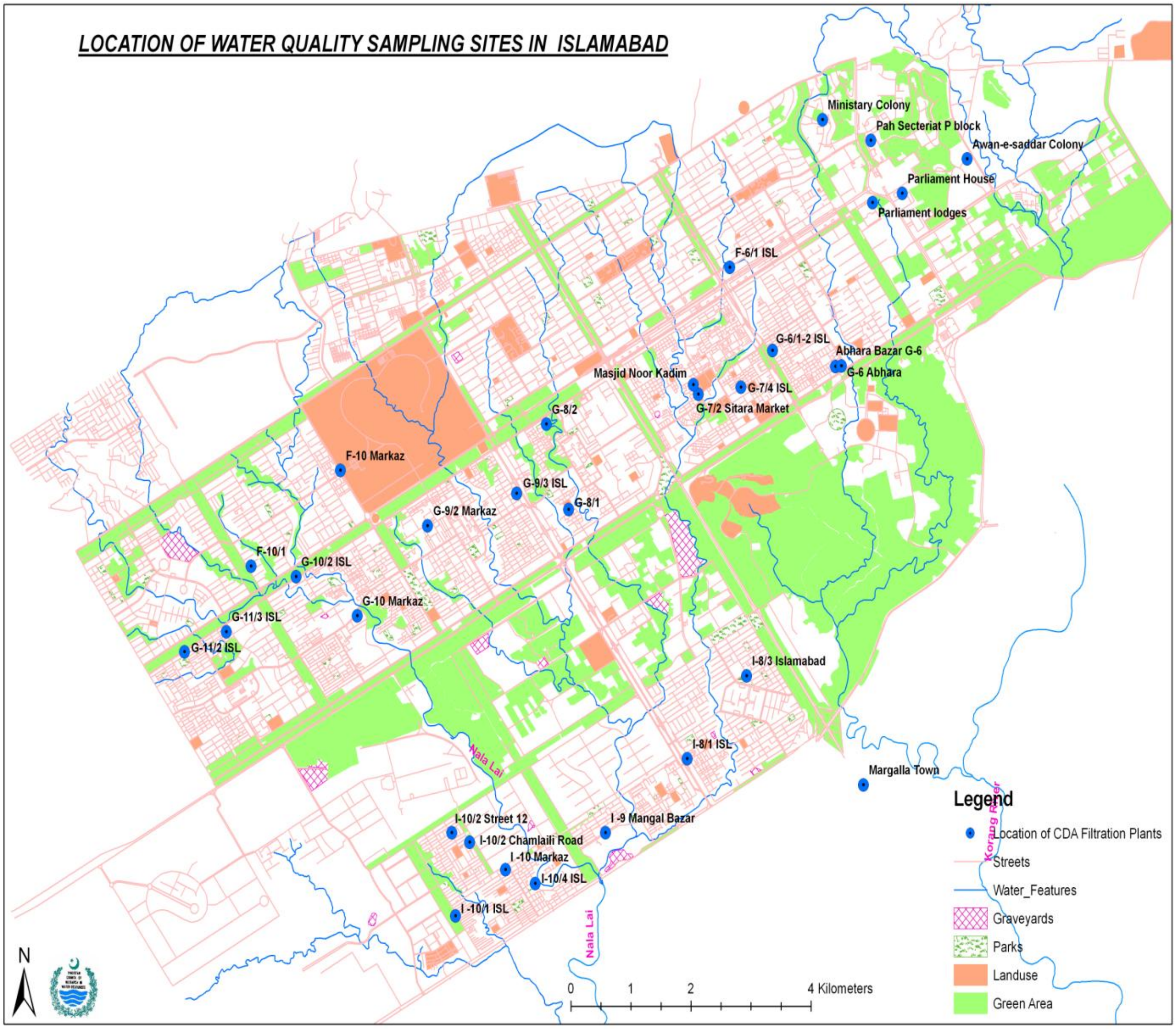
PCRWR LABORATORY FACILITIES

It is worthwhile to mention here that PCRWR has an ISO-17025 accredited National Water Quality Laboratory having analytical capabilities for wide range of physicochemical (inorganic and organic parameters) and microbiological parameters. PCRWR Water Quality Laboratories have a well defined quality control mechanism to generate reliable data. National Water Quality Laboratory (NWQL) participates regularly in FAPAS International Proficiency Programme (UK) as a part of its quality assurance plan.

Technical Facilities at National Water Quality Laboratory (NWQL) of PCRWR

PCRWR IDENTIFICATION CODES ALLOTED TO CDA FILTRATION PLANTS

Sr. No.	ID Code	Location	Operational Status
1.	CDA-1	I-8/2, Islamabad	Operational
2.	CDA-2	I-9/4, Islamabad	Operational
3.	CDA-3	G-9/2, Islamabad	Operational
4.	CDA-4	G-9/3, Islamabad	Operational
5.	CDA-5	Sitara Market, G-7/2, Islamabad	Unoperational
6.	CDA-6	G-7/4, Islamabad	Operational
7.	CDA-7	Abpara G-6, Islamabad	Operational
8.	CDA-8	F-6/1, Islamabad	Operational
9.	CDA-9	G-6/1-2, Islamabad	Unoperational
10.	CDA-10	G-10/2,	Operational
11.	CDA-11	G-11/2	Operational
12.	CDA-12	G-11/3	Operational
13.	CDA-13	F-10 Markaz	Operational
14.	CDA-14	F-10/1	Operational
15.	CDA-15	G-10 Markaz	Operational
16.	CDA-16	I-10 Markaz	Operational
17.	CDA-17	I-10/1	Operational
18.	CDA-18	I-10/4	Operational
19.	CDA-19	I-9 Mangal Bazar	Operational
20.	CDA-20	I-10/2	Operational
21.	CDA-21	I-8/1	Operational
22.	CDA-22	G-8/2	Operational
23.	CDA-23	G-8/1	Unoperational
24.	CDA-24	Minister Colony	Operational
25.	CDA-25	Pak Sectariet, P Block	Operational
26.	CDA-26	Parliament House	Operational
27.	CDA-27	Awan-e-Sadar Colony	Operational
28.	CDA-28	Parliament Lodges	Operational
29.	CDA-29	Masjid Noor Qadimi	Operational
30.	CDA-30	Abpara Bazar, G-6	Operational
31.	CDA-31	Margalla Town	Operational
32.	CDA-32	I-10/2, Chambeli Road	Unoperational
33.	CDA-33	G-6/2	Unoperational



Location of CDA Water Filtration Plants in Capital Territory of Islamabad

WATER QUALITY PARAMETERS AND METHODS USED FOR ANALYSIS

Sr. #	Parameters	Analytical Method
1.	Alkalinity (m.mol/l as $CaCO_3$)	2320-B, APHA Standard Method
2.	Arsenic (ppb)	3114-B, APHA Standard Method ,AAS Vario 6, Analytik Jena AG
3.	Bicarbonate	2320-B , APHA Standard Method
4.	Calcium (mg/l)	3500-B, APHA Standard Method
5.	Carbonate (mg/l)	2320-B, APHA Standard method
6.	Chloride (mg/l)	4500-BTitration (Silver Nitrate), APHA Standard Method
7.	Color (TCU)	Sensory Test
8.	Conductivity (μS/cm)	2510-B , APHA Standard Method, E.C Meter, Model 4320, Jenway, UK
9.	Hardness (mg/l)	2340-C ,EDTA Titration, APHA Standard Method
10.	Magnesium (mg/l)	3500-B, APHA Standard Method
11.	Nitrate- Nitrogen (mg/l)	4500-B , APHA Standard Method ,UV Spectrometric Method
12.	Odor	Sensory Test
13.	pH	4500-B , APHA Standard Method ,pH Meter, Hanna Instrument, Model 8519, Italy
14.	Potassium (mg/l)	3500-B , APHA Standard Method, Flame photometer PFP7, UK
15.	Sodium (mg/l)	3500-B , APHA Standard Method ,Flame photometer PFP7, UK
16.	Sulfate (mg/l)	4500-E , APHA Standard Method ,Turbidimetric Method by Spectrophotometer
17.	Phosphate (mg/l)	8048 (Hach), USEPA Method.
18.	Taste	Sensory Test
19.	TDS (mg/l)	2540C, APHA Standard method
20.	Turbidity (NTU)	2130-B, APHA Standard Method ,Nephlometric Method ,Turbidity Meter, HANNA
21.	Fluoride (mg/l)	4500-C. Ion-Selective Electrode APHA Standard Method
22.	Iron (mg/l)	FerroVer method (HACH Cat. 21057-69) USEPA Method
23.	Total Coliforms (MPN/100ml)	9221-B , Multiple Tube Fermentation technique (MPN) Chromogenic Method (EC- MUG) Media, IDEXX Method
24.	E. Coli (MPN/100ml)	9221-F ,Multiple Tube Fermentation technique (MPN) Chromogenic Method (EC- MUG) Media, IDEXX Method

WATER QUALITY PERMISSIBLE LIMITS FOR DRINKING WATER

Sr. #	Parameter	Units	Permissible Limits	
			WHO	PSQCA
1.	Alkalinity	mg/l	NGVS	NGVS
2.	Bicarbonate	mg/l	NGVS	NGVS
3.	Calcium	mg/l	NGVS	NGVS
4.	Carbonate	mg/l	NGVS	NGVS
5.	Chloride	mg/l	250	250
6.	Co lour	TCU	15	Colorless
7.	Conductivity	µS/cm	NGVS	NGVS
8.	Fluoride	mg/l	1.5	1.5
9.	Hardness	mg/l	NGVS	500
10	Iron	mg/l	0.3	0.3
11.	Magnesium	mg/l	NGVS	NGVS
12.	Odor	-	Odorless	Unobjectionable
13.	Nitrate-N	mg/l	10	10
14.	pH	-	6.5-8.5	6.5-8.5
15.	Potassium	mg/l	NGVS	NGVS
16.	Sodium	mg/l	200	NGVS
17.	Sulfate	mg/l	250	NGVS
18.	Taste	-	Unobject.	Unobjectionable
19.	TDS	mg/l	1000	1000
20.	Turbidity	NTU	5	<5
21.	Phosphate	mg/l	NGVS	NGVS
22.	Arsenic	ppb	10	50
23.	Total Coliforms	MPN/100ml	0	0
24.	E-Coli	MPN/100ml	0	0

WHO World Health Organization
PSQCA Pakistan Standards and Quality Control Authority

SUMMARY OF RESULTS OF PCRWR WATER QUALITY MONITORING

1. In total, 28 filtration plants were monitored.
2. Analytical results of all the filtration plants were compared with PSQCA and WHO permissible limits for drinking water.
3. Filtration plant installed in G-10/2 is found to supply the drinking water with excessive turbidity of 27 NTU.
4. Drinking water being supplied from filtration plant installed in F-10/1 has shown the slightly excessive levels of Nitrate i.e. 13 ppm.
5. Twenty two (22) filtration plants installed in various sectors have shown prevalence of bacteriological contamination in the water being supplied and thus found as highly unsafe.
6. Level of Free Residual Chlorine was found below Detection limit (0.05 ppm).

CONTAMINANTS OF POTENTIAL CONCERNS FOUND IN DRINKING WATER BEING SUPPLIED BY CDA WATER FILTRATION PLANTS

Microbiological Status (Total Coliforms & E-coli)

Sr. No	Filtration Plant ID Code	Location	Results	
			Total Coliforms (MPN/100ml)	E-coli (MPN/100ml)
1.	CDA-1	I-8/2	-ve	-ve
2.	CDA-2	I-9/4	22.8	-ve
3.	CDA-3	G-9/2	24.1	-ve
4.	CDA-4	G-9/3	3.1	-ve
5.	CDA-6	G-7/4	9.7	-ve
6.	CDA-7	G-6 Abpara	816.4	36.8
7.	CDA-8	F-6/1	387.3	387.3
8.	CDA-10	G-10/2	613.1	-ve
9.	CDA-11	G-11/2	-ve	-ve
10.	CDA-12	G-11/3	-ve	-ve
11.	CDA-13	F-10 Markaz	-ve	-ve
12.	CDA-14	F-10/1	160.7	-ve
13.	CDA-15	G-10 Markaz	2419.6	-ve
14.	CDA-16	I-10 Markaz	109.8	1.0
15.	CDA-17	I-10/1	11.8	-ve
16.	CDA-18	I-10/4	613.1	-ve
17.	CDA-19	I-9 Mangal bazar	686.7	-ve

18.	CDA-20	I-10/2	**74.7**	**15.5**
19.	CDA-21	I-8/1	**-ve**	**-ve**
20.	CDA-22	G-8/2	**10.9**	-ve
21.	CDA-24	Minister colony	**58.6**	**2.0**
22.	CDA-25	Pak Sectriate, P block	**-ve**	**-ve**
23.	CDA-26	Parliament house	**2419.6**	**10.9**
24.	CDA-27	Awan-e-Sadar colony	**22.8**	**1.0**
25.	CDA-28	Parliament lodges	**1553.1**	**178.9**
26.	CDA-29	Masjid near Qadiimi	**387.3**	**7.5**
27.	CDA-30	Abpara bazar	**2419.6**	**112.6**
28.	CDA-31	Margalla Town	**26**	-ve

MPN: Most Probable Number

FILTRATION PLANTS PROVIDING SAFE DRINKING WATER

Sr. No	Filtration Plant ID Code	Location	Quality (Safe/Unsafe)	
			Physico-Chemical	Microbiological
1.	CDA-1	I-8/2	Safe	Safe
2.	CDA-11	G-11/2	Safe	Safe
3.	CDA-12	G-11/3	Safe	Safe
4.	CDA-13	F-10 Markaz	Safe	Safe
5.	CDA-21	I-8/1	Safe	Safe
6.	CDA-25	Pak Secretariat, P block	Safe	Safe

FILTRATION PLANTS PROVIDING UNSAFE DRINKING WATER

Sr. No	Filtration Plant ID Code	Code	Quality (Safe/Unsafe)	
			Physico-Chemical	Microbiological
1.	CDA-2	I-9/4	Safe	Unsafe
2.	CDA-3	G-9/2	Safe	Unsafe
3.	CDA-4	G-9/3	Safe	Unsafe
4.	CDA-6	G-7/4	Safe	Unsafe
5.	CDA-7	G-6 Abpara	Safe	Unsafe
6.	CDA-8	F-6/1	Safe	Unsafe
7.	CDA-10	G-10/2	Unsafe	Unsafe
8.	CDA-14	F-10/1	Unsafe	Unsafe
9.	CDA-15	G-10 Markaz	Safe	Unsafe
10.	CDA-16	I-10 Markaz	Safe	Unsafe
11.	CDA-17	I-10/1	Safe	Unsafe
12.	CDA-18	I-10/4	Safe	Unsafe
13.	CDA-19	I-9 Mangal bazar	Safe	Unsafe
14.	CDA-20	I-10/2	Safe	Unsafe
15.	CDA-22	G-8/2	Safe	Unsafe
16.	CDA-24	Minister colony	Safe	Unsafe
17.	CDA-26	Parliament house	Safe	Unsafe
18.	CDA-27	Awan-e-Sadar colony	Safe	Unsafe
19.	CDA-28	Parliament lodges	Safe	Unsafe
20.	CDA-29	Masjid near Qadiimi	Safe	Unsafe
21.	CDA-30	Abpara bazar	Safe	Unsafe
22.	CDA-31	Margalla Town	Safe	Unsafe

DISEASE POTENTIAL FROM CONTAMINATED WATER

Sr. No	Contaminant	Diseases Impacts
1.	Bacteriological Contamination	Gastro-enteritis, Cholera, Diarrhea, Dysentery, Hepatitis A & E, Typhoid.

OVERALL CONCLUSIONS

Sr. No	Item	Conclusion	
		No.	% age
1.	Total Filtration Plants Monitored	28	-
2.	Filtration Plants Providing Safe Water	6	22
3.	Filtration Plants Providing Unsafe Water	22	78
4.	Filtration Plants Having Problem of Physico-Chemical Contamination	2	7
5.	Filtration Plants Having Problem of Microbiological Contamination	22	78

Detailed Water Quality Status of each water filtration plant is given at Annexure-1.

RECOMMENDATIONS

In order to improve the drinking water being supplied by CDA filtration plants, following actions are recommended:

1. Capacity of plant operator must be developed for effective chlorination, practice of analyzing free residual chlorine on daily basis and bacteriological contamination on weekly basis must be followed. In this respect, a log book should be maintained by plant operator and verified by concerned authorities on daily basis. Capacity building of CDA plant operators and management for O&M of filtration plants is also recommended.
2. Hygienic conditions at the plant site and its surroundings should be maintained regularly.
3. Replacements and maintenance of Ultraviolet Lamps/Filtration Cartridges should be carried out in time for continuous supply of safe drinking water.
4. Disinfection using chlorination should be ensured in the water supplies.

Above all there is a need to recognize that just because certain water-related practices have gone on for centuries does not mean that they are allowed to continue in the face of a world in turmoil. We need to change the way we think about water, the way we use water and the way we dispose off wastes in our water.

REFERENCES

- APHA, AWWA and WEF, D.E 2005. Standard Methods for the Examination of Water and Wastewater. American Public Health Association, American Water Works Association and Water Environment Federation, 18th Edition, Washington, DC.
- WHO Guidelines for Drinking-Water Quality. http://www.searo.who.int/EN/Section314_4295.htm#who
- Pakistan Standards Specification for Bottled Drinking Water, 3rd Revision 9PS:4639-2004. Pakistan Standards Quality Control Authority, Karachi, Pakistan.

Annexure-I

Analytical Results of CDA Filtration Plants

Sr. No	Filtration Plants Locations	Sample ID Code	Turbidly	Color	pH	EC	TDS	Ca	Mg	Hardness	Alkalinity
		Guideline Values (PSQCA)	5	Colorless	6.5 - 8.5	NGVS	1000	NGVS	NGVS	500	NGVS
		Units	*NTU*	_	-	*µS/cm*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*
		Detection Limit	*0.2*	_	*0.02*	0.28	_	*2*	*1*	*5*	_
1	I-8/2	CDA-1	BDL	Colorless	7.09	663	365	92	17	300	295
2	I-9/4	CDA-2	BDL	Colorless	8.09	754	414	92	29	350	340
3	G-9/2	CDA-3	BDL	Colorless	7.28	757	416	80	24	300	330
4	G-9/3	CDA-4	BDL	Colorless	7.13	690	380	68	22	260	335
5	G-7/4	CDA-6	BDL	Colorless	7.48	530	292	60	19	230	225
6	G-6 Abpara	CDA-7	BDL	Colorless	7.49	340	187	52	9	165	160
7	F-6/1	CDA-8	BDL	Colorless	6.98	770	420	100	24	350	320
8	G-10/2	CDA-10	**27**	Colorless	7.58	668	367	60	22	240	235
9	G-11/2	CDA-11	BDL	Colorless	7.41	688	378	80	24	300	330
10	G-11/3	CDA-12	BDL	Colorless	7.50	769	423	68	22	260	315
11	F-10 Markaz	CDA-13	BDL	Colorless	7.51	381	210	44	19	190	140
12	F-10/1	CDA-14	BDL	Colorless	7.11	920	552	84	32	340	330
13	G-10 Markaz	CDA-15	BDL	Colorless	7.59	670	369	50	35	270	240
14	I-10 Markaz	CDA-16	BDL	Colorless	7.29	560	308	80	17	270	250
15	I-10/1	CDA-17	BDL	Colorless	7.16	714	393	76	27	300	320
16	I-10/4	CDA-18	BDL	Colorless	7.51	726	399	80	24	300	320
17	I-9 Mangal bazar	CDA-19	BDL	Colorless	7.25	754	415	84	22	300	320
18	I-10/2	CDA-20	BDL	Colorless	7.53	505	278	56	22	230	240
19	I-8/1	CDA-21	BDL	Colorless	6.95	737	405	80	29	320	340
20	G-8/2	CDA-22	BDL	Colorless	7.26	680	374	40	49	300	300
21	Minister colony	CDA-24	BDL	Coloress	7.49	336	185	40	12	150	155
22	Pak Sectriate, P block	CDA-25	BDL	Coloress	7.62	315	173	42	11	150	150
23	Parliament house	CDA-26	BDL	Coloress	7.62	336	185	40	17	170	165
24	Awan-e-Sadar colony	CDA-27	BDL	Coloress	7.64	338	186	40	17	170	160
25	Parliament lodges	CDA-28	BDL	Coloress	7.26	622	342	40	44	280	270
26	Masjid noor Qadiimi, G-7/3	CDA-29	BDL	Coloress	7.18	557	306	40	39	260	250
27	Abpara bazar	CDA-30	BDL	Coloress	7.43	336	185	40	18	175	160
28	Margalla Town	CDA-31	BDL	Coloress	7.20	576	317	80	19	280	270

Monitoring Report of Drinking Water Filtration Plants

Sr. No	Filtration Plants Locations	Sample ID Code	HCO3	CO_3	Cl^-	Na	Fl	Fe	K	NO_3	SO_4
		Guideline Values (PSQCA)	NGVS	NGVS	250	NGVS	1.5	0.3	NGVS	10	NGVS
		Units	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*
		Detection Limit	*5*	*5*	*2*	*1*	*0.03*	*0.03*	*0.2*	*0.06*	*0.4*
1	I-8/2	CDA-1	295	BDL	21	26	4.0	BDL	1.9	4.0	BDL
2	I-9/4	CDA-2	340	BDL	21	31	4.0	BDL	1.5	4.0	10
3	G-9/2	CDA-3	330	BDL	24	50	BDL	BDL	1.3	4.0	42
4	G-9/3	CDA-4	335	BDL	17	45	BDL	BDL	2.6	3.0	11
5	G-7/4	CDA-6	225	BDL	18	30	2.0	BDL	1.5	2.0	12
6	G-6 Abpara	CDA-7	160	BDL	11	12	1.0	BDL	2.3	1.0	BDL
7	F-6/1	CDA-8	320	BDL	27	26	6.0	BDL	1.1	6.0	10
8	G-10/2	CDA-10	235	BDL	24	50	BDL	1.03	1.6	4.0	49
9	G-11/2	CDA-11	330	BDL	20	40	BDL	0.06	1.1	3.0	14
10	G-11/3	CDA-12	315	BDL	24	55	0.12	BDL	1.4	4.0	52
11	F-10 Markaz	CDA-13	140	BDL	15	5.0	0.59	BDL	1.2	1.0	32
12	F-10/1	CDA-14	330	BDL	51	58	1.16	0.05	1.6	13	56
13	G-10 Markaz	CDA-15	240	BDL	28	48	BDL	BDL	1.5	4.0	59
14	I-10 Markaz	CDA-16	250	BDL	16	18	2.0	BDL	2	2.0	6
15	I-10/1	CDA-17	320	BDL	23	44	0.26	0.06	1.5	3.0	20
16	I-10/4	CDA-18	320	BDL	25	40	0.31	BDL	1.4	3.0	37
17	I-9 Mangal bazar	CDA-19	320	BDL	24	33	0.24	BDL	1.4	5.0	35
18	I-10/2	CDA-20	240	BDL	17	20	BDL	BDL	2.3	2.0	31
19	I-8/1	CDA-21	340	BDL	21	24	1.26	BDL	1.2	4.0	26
20	G-8/2	CDA-22	300	BDL	17	17	1.27	BDL	1.5	3.0	33
21	Minister colony	CDA-24	155	BDL	13	11	0.92	0.06	2.5	1.0	15
22	Pak Sectriate, P block	CDA-25	150	BDL	7	11	0.48	BDL	2.1	1.0	12
23	Parliament house	CDA-26	165	BDL	13	11	0.65	0.07	2.0	0.8	15
24	Awan-e-Sadar colony	CDA-27	160	BDL	12	11	1.65	BDL	2.0	0.8	18
25	Parliament lodges	CDA-28	270	BDL	17	20	1.39	BDL	0.9	2.5	48
26	Masjid noor Qadiimi, G-7/3	CDA-29	250	BDL	17	11	1.86	BDL	1.4	2.3	32
27	Abpara bazar	CDA-30	160	BDL	12	10	0.98	0.03	1.9	0.8	20
28	Margalla Town	CDA-31	270	BDL	24	15	0.65	BDL	1.0	1.0	19

Monitoring Report of Drinking Water Filtration Plants

Sr. No	Filtration Plants Locations	Sample ID Code	PO_4	Arsenic	*Total Coliform*	*E.coli*
		Guideline Values (PSQCA)	NGVS	50	0	0
		Units	*ppm*	*ppb*	MPN/100ml	MPN/100ml
		Detection Limit	*0.03*	*0.106*	_	_
1	I-8/2	CDA-1	BDL	0.12	-ve	-ve
2	I-9/4	CDA-2	BDL	0.18	22.8	-ve
3	G-9/2	CDA-3	BDL	0.38	24.1	-ve
4	G-9/3	CDA-4	BDL	0.32	3.1	-ve
5	G-7/4	CDA-6	BDL	0.25	9.7	-ve
6	G-6 Abpara	CDA-7	BDL	BDL	816.4	36.8
7	F-6/1	CDA-8	BDL	0.28	387.3	387.3
8	G-10/2	CDA-10	BDL	BDL	613.1	-ve
9	G-11/2	CDA-11	BDL	0.28	-ve	-ve
10	G-11/3	CDA-12	BDL	0.26	-ve	-ve
11	F-10 Markaz	CDA-13	BDL	0.37	-ve	-ve
12	F-10/1	CDA-14	BDL	0.31	160.7	-ve
13	G-10 Markaz	CDA-15	BDL	BDL	2419.6	-ve
14	I-10 Markaz	CDA-16	BDL	0.28	109.8	1.0
15	I-10/1	CDA-17	0.05	BDL	11.8	-ve
16	I-10/4	CDA-18	0.04	0.23	613.1	-ve
17	I-9 Mangal bazar	CDA-19	BDL	0.15	686.7	-ve
18	I-10/2	CDA-20	0.04	0.55	74.7	15.5
19	I-8/1	CDA-21	BDL	0.33	-ve	-ve
20	G-8/2	CDA-22	BDL	0.33	10.9	-ve
21	Minister colony	CDA-24	BDL	0.55	58.6	2.0
22	Pak Sectriate, P block	CDA-25	BDL	0.52	-ve	-ve
23	Parliament house	CDA-26	BDL	0.71	2419.6	10.9
24	Awan-e-Sadar colony	CDA-27	BDL	0.58	22.8	1.0
25	Parliament lodges	CDA-28	BDL	0.35	1553.1	178.9
26	Masjid noor Qadiimi, G-7/3	CDA-29	BDL	0.32	387.3	7.5
27	Abpara bazaar	CDA-30	BDL	0.72	2419.6	112.6
28	Margalla Town	CDA-31	BDL	BDL	26	-ve

NGVS= No Guideline Value Set, MPN=Most Probable Number, TDS= Total dissolved Solids, NTU= Nephelometric Turbidity unit, BDL=Below Detection Limit