

The Water Quality Regulations 2009



July 2009

Issued by:

**The Regulation and Supervision Bureau
for the Water, Wastewater and Electricity Sector
in the Emirate of Abu Dhabi**

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www.rsb.gov.ae

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Foreword

The Regulation and Supervision Bureau (the Bureau) is established in Abu Dhabi law to oversee the economic and technical activities of the electricity, water and wastewater companies that are licensed to operate in or supply to the Emirate of Abu Dhabi.

In addition to its duties over licensed companies, the Bureau has certain responsibilities towards the general public, including the assurance of safe and efficient drinking water supplies to consumers and these Regulations have been produced primarily with this aim in mind.

These revised Regulations (Revision 3) supersede those issued in 2004 (Revision 2) and are effective as from 1 January 2010. They may be cited as the Water Quality Regulations (2009) referred hereafter as the Regulations.

These Regulations are intended to provide for the supply of wholesome drinking water to consumers throughout the Emirate of Abu Dhabi and reflect the current guidance by the World Health Organisation. They have been produced following extensive consultation with sector companies.

They are also available in Arabic, but the reader should note they were first written in English. They may also be downloaded from the Bureau's website at www.rsb.gov.ae.

Nicholas Carter
Director General

1 January 2010

List of revisions

Revision Number	Date	Prepared by:	Checked by:	Issued to:
REV.0	January 2000	J. Shadid	S. Nemer	All Licensees Publications
REV.1	February 2002	J. Shadid	S. Nemer	All Licensees Publications
REV.2	January 2004	J. Shadid N. Ali	L. Hill	All Licensees Publications
REV.3	July 2009	J. Shadid N. Ali	C. Hannan	All Licensees Publications

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The Water Quality Regulations

The Regulation and Supervision Bureau for the Water, Wastewater and Electricity Sector in the Emirate of Abu Dhabi in exercise of its powers conferred under Article (62) of Law No (2) of 1998 Concerning the Regulation of the Water and Electricity Sector in the Emirate of Abu Dhabi, as amended, hereby makes the following Regulations.

Part 1: Introduction

1.1 Citation and commencement

- 1.1.1 These Regulations may be cited as the Water Quality Regulations 2009.
- 1.1.2 These Regulations supersede Revision 2 of the Water Quality Regulations. These Regulations may be cited as the Water Quality Regulations 2009 (hereafter referred to as the Regulations) and are effective from 1 January 2010.
- 1.1.3 The following words and expressions shall have the following meanings in these Regulations unless the context otherwise requires:

1.2 Interpretation

Words and expressions, other than those defined in paragraph 1.2 above, which are defined in the Law shall have the meanings ascribed to them in the Law.

Words and expressions to which meanings are assigned by these Regulations shall (unless the contrary intention appears) have the same respective meanings in any document issued by the Bureau under these Regulations.

Unless the context otherwise require any reference in these Regulations to a numbered Part, paragraph or Schedule is a reference to the Part, paragraph or Schedule of these Regulations bearing that number.

Any reference in these Regulations to a table is a reference to the relevant table in the numbered Schedules of these Regulations.

- 1.2.1 **Bureau** - the Regulation and Supervision Bureau for the Water, Wastewater and Electricity Sector in the Emirate of Abu Dhabi, established under the Law;
- 1.2.2 **Consumer** - a person to whom water is supplied for a purpose mentioned in paragraph 2.1;

- 1.2.3 **Distribution Companies** - a distribution company or body holding a Licence from the Bureau, pursuant to the Law;
- 1.2.4 **Law** - Law No (2) of 1998 Concerning the Regulation of the Water and Electricity Sector in the Emirate of Abu Dhabi, as amended.
- 1.2.5 **Licensed Supplier** - the Supplier who holds a licence granted by the Bureau;
- 1.2.6 **Licensed Transmission Operator** - a person who is authorised by a licence granted under the Law to transmit electricity and/or water;
- 1.2.7 **Parameter** - a property, element, organism or substance listed in the second column of the Tables in Schedule 1 to these Regulations;
- 1.2.8 **Plant** - all water plant used in raw water abstraction i.e. ground water, water production, water treatment, transmission and distribution that describes the fixed infrastructure above and below ground;
- 1.2.9 **Prescribed Concentration or Value (PCV)** - in relation to any Parameter, means the maximum or minimum concentration or value specified in relation to that Parameter in the Tables in Schedule 1 to these Regulations as measured by reference to the unit of measurement so specified;
- 1.2.10 **Sampling Point** - a point that is determined as such by a Licensed Supplier for the purposes of Part 4 of these Regulations;
- 1.2.11 **Supplier** - any person who delivers water to or conveys water through trunk mains pipelines or mains pipelines, or delivers water by road vehicle for a purpose mentioned in paragraph 2.1, and cognate expressions shall be construed accordingly;
- 1.2.12 **Standard Methods** - is the standard analytical method for the examination of water and waste water published

by the American Public Health Association, the American Water Works Association and the Water Environment Federation;

- 1.2.13 **Water Supply Zone** - an area that is designated by a Supplier (whether by reference to a source of supply, the number of persons supplied from any source, or otherwise) for the purposes of the provisions of these Regulations;
- 1.2.14 **Water Transmission Code** - the transmission code or codes of that name required to be prepared by a Licensed Transmission Operator and approved by the Bureau;
- 1.2.15 **Water Tanker** - means a road vehicle licensed by the Abu Dhabi Police Traffic and Licensing Department following certification of the tanker by the Distribution Company for the purposes of distributing and supplying Wholesome Water sourced from designated water filling stations which are owned, operated and controlled by the Distribution Companies.
- 1.2.16 **Year** - calendar year, according to the Gregorian calendar.

Part 2: Wholesomeness

- 2.1 All water supplied for the purposes of drinking, washing, cooking or food production shall be wholesome.
- 2.2 Water supplied for the purposes of drinking, washing or cooking or for food production purposes shall be regarded as wholesome if the requirements of paragraph 2.3 below are satisfied.
- 2.3 The requirements of this paragraph are:
- (a) that the water does not contain any element, organism or substance (other than a Parameter) at a concentration or value which would be detrimental to public health;
 - (b) that the water does not contain any element, organism or substance (whether or not a Parameter) at a concentration or value which, in conjunction with any other element, organism or substance it contains (whether or not a Parameter), would be detrimental to public health; and
 - (c) that the water does not contain concentrations or values of the Parameters listed in Tables A to Table H in Schedule 1 in excess of the Prescribed Concentrations or Values;
- 2.4 The Bureau will consider either the World Health Organization (WHO) Water Quality Guidelines or the Emirates Authority for Standardisation and Metrology (ESMA) Drinking Water Standards as a reference for the Regulations' maximum Prescribed Concentration or Values (PCV) included in Schedule 1 for all other Parameters not included in Tables A to H.

Part 3: Relaxation of requirements under Part 2

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- 3.1 The Bureau may, upon the written application of a Supplier, authorise a relaxation of the provisions of Part 2 with respect to supply of water by that Supplier.
- 3.2 Subject to paragraphs 3.3 and 3.4, the Bureau may at any time modify or revoke an authorisation (whether or not the authorisation is expressly given for a specified period) pursuant to paragraph 3.1 above.
- 3.3 The Bureau shall not revoke or modify an authorisation without giving at least 6 months' notice or, if the holder of the authorisation agrees, at least 6 weeks' notice by the Bureau of its intention to do so but the Bureau may revoke or modify an authorisation without notice if it appears to the Bureau that the immediate revocation or modification of the authorisation is required in the interests of public health.
- 3.4 A Supplier on whose application an authorisation has been given under this Part shall notify the Bureau as soon as the circumstances which gave rise to the application for the authorisation cease to exist, and, notwithstanding paragraph 3.3 above, the Bureau shall thereupon revoke the authorisation.

Part 4: Monitoring of water supplies

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- 4.1 Part 4 applies to water supplied for any of the purposes described in paragraph 2.1
- 4.2 In this Part 4:
- (a) **“Revised Number”** means any relevant reduced or increased frequency shown in any Table as an alternative to the standard number; and the Bureau shall have the discretion to require the Supplier to sample according to reduced or increased frequency as it finds necessary to do so. Otherwise the standard number shall be the applicable frequency.
 - (b) **“The Standard Number”** means such number specified in the column headed **“Standard”** in Tables 1 to 7 of Schedule 2 as is applicable to the Parameter in question by reference purposes, for that purpose from that zone to the number of persons estimated to have been supplied or by reference to the volume of water supplied for domestic purposes.
- 4.3 For the purpose of determining whether water to which these Regulations apply satisfies the provisions of Part 2 or, as the case may be, those provisions as relaxed by an authorisation given under Part 3, a Licensed Supplier shall take and analyse or cause to be analysed such number of samples of the water within each of its Plants, Water Supply Zones or from its Water Tankers as is specified in this Part.
- 4.4 Subject to paragraph 4.8, a Licensed Supplier shall determine, in respect of each of its Plant, Water Supply Zones or Water Tankers, such number and location of sampling points as will in its opinion secure that analysis of samples obtained from those points in respect of the Parameters listed in Tables A to H will, so far as is reasonably practicable, produce data which are representative of the quality of the water supplied by it.
- 4.5 Each year, a Licensed Supplier to whom these Regulations apply shall take from its sampling points for analysis and testing for compliance with each Parameter not less than such Standard Number of samples as is specified in Tables 1 to 7 of schedule 2 in relation to the Parameter in question.

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- 4.6 The number of samples to be taken in respect of any Parameter may, if the Bureau so authorises, be revised in relation to that Parameter in the relevant table.
- 4.7 Where no Standard Number is specified in relation to a Parameter listed in Schedule 1, a Licensed Supplier shall take sufficient samples of water within a Plant, Water Supply Zone or from Water Tankers in order to establish whether or not the water is wholesome, should there be any reasonable grounds for believing that:
- (a) the Prescribed Concentration or Value in respect of that Parameter has been exceeded or may be exceeded within the next 3 months; or
 - (b) the Prescribed Concentration or Value in respect of any other Parameter has been exceeded or may be exceeded within the next 3 months and the taking and analysis of samples in relation to the Parameter first mentioned would assist in deciding whether, and if so what remedial action should be taken.
- 4.8 A Licensed Supplier shall take sufficient samples of water within a Water Supply Zone or from a road vehicle in respect of any element, organism or substance, other than a Parameter, in order to establish whether or not that water is detrimental to public health as soon as it believes or has reasonable grounds for believing that an element, organism or substance, whether alone or in combination with a Parameter or any other element, organism or substance may cause the supply within that zone or from that vehicle to be a supply which does not satisfy the provisions of Part 2 or, where those provisions have been relaxed by an authorisation given under Part 3, those provisions as so relaxed.
- 4.9 Paragraph 4.10 applies for any source which has not been used for a period of 3 months preceding the date on which the Supplier proposes to supply water from it.
- 4.10 A Supplier shall before it supplies water from a source mentioned in paragraph 4.9 take in accordance with

paragraph 4.11 such samples of that water as will enable it to establish:

- (a) whether water can be supplied from that source without contravening these Regulations; and
- (b) the treatment necessary to ensure that these Regulations are complied with in relation to the supply of that water.

4.11 Samples shall be taken in the case of a source mentioned in paragraph 4.9, in respect of:

- (a) each of the Parameters listed in Schedule 1; and
- (b) any other element, organism or substance which, in the opinion of the Supplier, may cause the supply to contravene these Regulations.

4.12 A Licensed Supplier shall secure, so far as is reasonably practicable, that in taking, handling, transporting, storing and analysing or causing to be analysed any sample taken for the purposes of Parts 4 and 5 of these Regulations, the appropriate requirements are satisfied.

4.13 In paragraph 4.12 “the appropriate requirements” means such of the following requirements as are applicable:

- (a) the sample is representative of the quality of the water at the time of sampling;
- (b) the sample collection programme should be made with sampling from predetermined locations at equal intervals over the year;
- (c) the sample is not contaminated when being taken or transported; and
- (d) the sample is kept at such temperature and in such conditions as will secure that there is no material alteration of the concentration or value for the measurement or observation of which the sample is intended;

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- (e) the sample is analysed as soon as may be practicable after it has been taken:
 - i) by or under the supervision of a person who is competent to perform that task;
 - ii) with the use of such equipment as is suitable for the purpose;
 - iii) by applying such recognised analytical systems and methods, such as the Standard Method for the Examination of Water and Wastewater, (or any other method as may be approved by the Bureau) capable of establishing, within acceptable limits of deviation and detection, whether the sample contains concentrations or values which contravene the Prescribed Concentrations or Values; and
 - (f) any laboratory at which samples are analysed and which has a system of analytical quality control that is subject from time to time to checking by a person who is:
 - i) not under the control of either the laboratory or the person to whom these Regulations apply; and
 - ii) approved by the Bureau for that purpose.

4.14 In the event that the test results value of one or more of the Parameters included in Tables A to H lies outside the Prescribed Concentration or Value (PCV) limit, particularly Table F (microbiological Parameters), immediate remedial action shall be taken in accordance with the operating code of the Water Transmission Code.

4.15 A Supplier shall not apply any substance or product to, or introduce any substance or product into water, which is to be supplied for drinking, washing, cooking or food production purposes unless:

- (a) the Bureau has approved the application or introduction of that substance or product and it is applied or

-
- introduced in accordance with any conditions attached to that approval; and
- (b) the Supplier is completely satisfied that the substance or product either alone or in combination with any other substance or product in the water is not likely to affect the wholesomeness of the water supplied;
- 4.16 The Bureau may, if it decides to issue an approval for the purpose of paragraph 4.15 (a), include in the approval such conditions as it considers appropriate and, subject to paragraph 4.18, may at any time revoke or vary any approval it has previously given.
- 4.17 The Bureau may by notice given in writing to a Supplier prohibit it for such period as is specified in the notice from applying to, or introducing into water intended to be supplied for drinking, washing, cooking or food production purposes, any substance or product which the Supplier would otherwise be authorised to apply or introduce by paragraph 4.15 (a).
- 4.18 The Bureau may:
- (a) revoke in writing any approval given by it for the purposes of paragraph 4.15 (a);
- (b) modify any such approval in writing by including conditions, or varying existing conditions; or
- (c) issue any such notice as is mentioned in paragraph 4.17,
- unless it is satisfied that it is necessary to do so in the interests of public health without notice, shall not apply the above without giving all such persons as are, in its opinion, likely to be affected by the revocation or modification of the approval or by the issue of the notice at least 6 months notice in writing of its intention.
- 4.19 The Bureau may at any time by notice in writing given to a Supplier, require it to make an application to the Bureau for

approval of the use of any process, and may prohibit it for such period as may be specified in the notice from using any such process in connection with the delivery or conveyance by the supplier of water for drinking, washing, cooking or food production purposes.

4.20 The Bureau may refuse the application or impose on any approval given for the purposes of these Regulations such conditions as it thinks fit and, subject to paragraph 4.21, may at any time by notice in writing to the person, revoke an approval so given or modify or revoke any condition imposed by virtue of this paragraph.

4.21 The Bureau shall not:

- (a) revoke any approval given for the purposes of these Regulations;
- (b) modify any condition imposed by virtue of paragraph 4.20; or
- (c) prohibit a Supplier from using any process,

unless it has given to the Supplier at least 6 months notice in writing of its intention provided that this paragraph shall not apply in any case in which the Bureau is of the opinion that the immediate revocation, modification or prohibition is necessary in the interests of public health.

4.22 The Bureau may, by notice in writing, require the Supplier who makes an application for an approval under paragraph 4.19 to pay to it a charge which reflects the administrative expenses (excluding the costs of conducting any tests) incurred or likely to be incurred by the Bureau in connection with that application; and in determining the amount of any charge the Bureau may adopt such methods and principles for its calculation as appear to it to be appropriate.

- 5.1 A Licensed Supplier shall prepare and maintain, in respect of each of its Plant, Water Supply Zones and Water Tankers, a record containing:
- (a) the name or the identification number of the zone, water tanker, well field, desalination plant, reservoir or pumping plant;
 - (b) as relevant, an estimate of the population or volume of water distributed in the zone or the capacity of Water Tanker, the Plant and plant process;
 - (c) a programme of sampling schedule;
 - (d) particulars of any relaxation granted under Part 3 which applies to water supplied in the zone;
 - (e) particulars of the result of any analysis of samples taken in accordance with Part 4 of these Regulations;
 - (f) information in the form in Schedule 3 hereto; and
 - (g) such particulars as the Licensed Supplier may determine.
- 5.2 A Licensed Supplier shall make available to the Bureau:
- (a) initial entries in the register in respect of the matters mentioned in paragraph 5.1 (a) to (c) no later than week 40 of each year;
 - (b) entries relating to the results of the analysis of samples within 14 days of the sample collection date according to the sampling programme in a form approved by the Bureau or in which the result is first known to the person or sooner where the data gives cause for concern; and
 - (c) an entry of the information mentioned in paragraph 5.1(c) when paragraph 5.7 is complied with.
- 5.3 Without prejudice to paragraph 5.2, the Licensed Supplier shall at least once in each year review and bring up to date

the record required to be kept by paragraph 5.1.

- 5.4 Nothing in these Regulations shall require a Licensed Supplier to retain a record of any information mentioned in paragraph 5.1 (d) or (e) at any time more than 5 years after the date on which the information was first entered in the record.
- 5.5 A Distribution Company shall make available for inspection by the public at all reasonable hours and free of charge at such of its offices as are normally open to the public any record maintained by it in accordance with paragraph 5.1.
- 5.6 A Distribution Company shall afford to any person facilities to take or obtain a copy of any part of a record maintained in accordance with paragraph 5.1:
- (a) in the case of a person who receives a supply of water in the zone and whose request is confined to information relating to that zone, free of charge;
 - (b) in any other case, on payment of such reasonable charge as the Distribution Company may determine.
- 5.7 A Distribution Company shall include in or append to at least one of the accounts sent to each customer in any year a statement informing the public that records of water quality may be inspected by the public free of charge and of the address, telephone number and hours of opening of at least one of the offices at which an inspection can be made.
- 5.8 A Licensed Supplier shall prepare a report for each year and, in respect of the statement in paragraph (b), including:
- (a) a summary of the quality of water supplied by it;
 - (b) a statement as to the extent to which water supplied by it complied with Part 2 of these Regulations; and
 - (c) particulars of any relaxation granted under Part 3 which applies to water supplied by it.

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- 5.9 The statement required by paragraph 5.8 (b) shall specify, in the form set out in Form A (I – III) and Form B in Schedule 3 to these Regulations, or in any other form provided by the Bureau the results of the analysis of samples required under paragraph 4.3.
- 5.10 On or before 31 March each year, a Licensed Supplier shall send to the Bureau a copy of the annual report referred to in paragraph 5.8 and on or before the last day of the month following the end of the quarter in question a copy of the quarterly report referred to in that paragraph.

Part 6: Enforcement

- 6.1 Failure of any person to comply with these Regulations shall be contrary to, and enforced in accordance with, the Law.
- 6.2 These Regulations are subject to modification or revocation by the Bureau at any time and from time to time.

SCHEDULES

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Schedule 1

Prescribed Concentrations or Values

Schedule 1: Prescribed Concentrations or Values

1

Table A - Physical Parameters

Item	Parameters	Units of measurement	Prescribed Concentration or Value (maximum unless otherwise stated)
1	Colour	mg/ l pt/Co scale	15
2	Turbidity (including suspended solids)	NTU (Nephelometric Turbidity Unit)	4
3	Odour (including hydrogen sulphide)	Dilution number	Unobjectionable
4	Taste	Dilution number	Unobjectionable
5	Total Dissolved Solids	mg/ l	100 (minimum) 1000 (maximum)
6	Calcium Hardness	mg/ l as CaCO ₃	200 at 25 °C
7	Total Hardness	mg/ l as CaCO ₃	300 at 25°C
8	Residual Chlorine	mg/ l Cl ₂	0.20 (minimum) 0.50 (maximum)
9	Conductivity	µmhos/cm	160 (minimum) 1600 (maximum)
10	Hydrogen ion (i)	pH value	7.0 (minimum) 9.2 (maximum)

- (i) The optimum level for pH of the produced desalinated water shall range from 8.0 to 9.0.

Remarks: The water supplied should not be aggressive and where measured by Langelier Index, the value should be slightly positive in the range of 0.0 to 0.5.

Table B - Inorganic chemical Parameters (i)

Item	Parameters	Units of measurement	Prescribed Concentration or Value (maximum unless otherwise stated)
1	Sulphate	mg SO ₄ / l	250
2	Magnesium	mg Mg/ l	30
3	Sodium	mg Na/ l	150
4	Potassium	mg K/ l	12
5	Chlorides	mg Cl/ l	250
6	Nitrate	mg NO ₃ / l	50
7	Nitrite	mg NO ₂ / l	0.1
8	Ammonium (ammonia and ammonium ions)	mg NH ₄ / l	0.5
9	Total Organic Carbon (ii)	mg C/ l	No significant increase over that normally observed
10	Aluminium	mg Al/ l	0.2
11	Iron	mg Fe/ l	0.2
12	Copper	mg Cu/ l	1
13	Zinc	mg Zn/ l	5
14	Phosphorus	mg P/ l	2.2

- (i) The only exception in the table is Total Organic Carbon (TOC).
- (ii) The normally observed value of TOC in the network is < 1 mg C/l during the normal operation and < 2 mg C/l in newly commissioned or repaired systems. Any increase over these values requires further investigation.

Table C - Inorganic chemical Parameters (mostly trace elements)

Item	Parameters	Units of measurement	Prescribed Concentration or Value (maximum unless otherwise stated)
1	Arsenic	µg As/ l	10
2	Cadmium	µg Cd/ l	3
3	Chromium	µg Cr/ l	50
4	Mercury	µg Hg/ l	6
5	Nickel	µg Ni/ l	70
6	Lead	µg Pb/ l	10
7	Antimony	µg Sb/ l	20
8	Selenium	µg Se/ l	10
9	Barium	µg Ba/ l	700
10	Boron	µg B/ l	1000
11	Manganese	µg Mn/ l	400
12	Fluoride	µg F/ l	1500

Table D - Miscellaneous organic Parameters (mostly pesticides)

Item	Parameters	Units of measurement	Prescribed Concentration or Value (maximum unless otherwise stated)
1	Endrine	µg/ l	0.6
2	Lindane	µg / l	2
3	Methoxychlor	µg / l	20
4	2,4 dichlorophexy acetic acid	µg/ l	30
5	2,4,5 trichlorophenoxy propionic acid	µg/ l	9
6	Phenols	µg / l	0.5
7	Heptachlor	µg/ l	0.03
8	Aldrin	µg/ l	0.03
9	DDT	µg/ l	1
10	Chlordane	µg/ l	0.2
11	Dieldrin	µg/ l	0.03
12	Heptachlor epoxide	µg/ l	0.03
13	Cyanide	µg/ l	70

Table E - Organic Parameters

Item	Parameters	Units of measurement	Prescribed Concentration or Value (maximum unless otherwise stated)
1	Trichloroethene	µg / l	20
2	Tetrachloromethane	µg / l	3
3	Tetrachloroethene	µg / l	40
4	1,2 Dichloroethane	µg / l	30
5	Benzene	µg / l	10
6	Benzo(a)pyrene	µg / l	0.7
7	Dichloromethane	µg / l	20
8	Chlorobenzene	µg / l	300
9	1,2-Dichloroethene	µg / l	50
10	Toluene	µg / l	700
11	1,2-Dichlorobenzene	µg / l	1000
12	1,4-Dichlorobenzene	µg / l	300
13	Vinyl Chloride	µg / l	0.3

Table F - Microbial Parameters

Item	Parameters	Units of measurement	Prescribed Concentration or Value (maximum unless otherwise stated)
1	Total coliforms (i)	Number/100ml	0
2	E.coli or thermotolerant Faecal coliform bacteria (i)	Number/100ml	0
3	Enterococci	Number/100 ml	0
4	Total Bacterial Count	Number/1 ml at 37°C	10 at 37°C

- (i) Immediate action must be taken if either E.Coli or Total coliform bacteria are detected.

Remarks: Pseudomonas and Sulphite reducing bacteria testing are required to be carried in the transmission and distribution network as an indicator for possible taste, odour and colour problems or in the event of contamination incidents.

Table G - Radioactive Parameters

Item	Parameters	Units of measurement	Prescribed Concentration or Value (maximum unless otherwise stated)
1	Gross α	Bq/ l	≤ 0.5
2	Gross β	Bq/ l	≤ 1

Remarks: Initial screening for gross α / or gross β activity to determine whether the activity concentrations are below levels at which no further action is required. If initial screening levels exceed the above then investigation and monitoring of individual radionuclide should follow immediately. The limits for the individual radionuclide should be in accordance with WHO Water Quality Guidelines latest edition.

Table H - Disinfection and Disinfection By-Products (DBPs)

Item	Parameters	Units of measurement	Prescribed Concentration or Value (maximum unless otherwise stated)
1	Bromate (i)	mg/ l	0.01
2	Chlorate	mg/ l	0.7
3	Chlorite	mg/ l	0.7
4	Bromoform	mg/ l	0.1
5	Bromodichloromethane (BDCM)	mg/ l	0.06
6	Chloroform	mg/ l	0.3
7	Dibromochloromethane (DBCM)	mg/ l	0.1
8	Formaldehyde	mg/ l	0.9
9	THMs (ii)	-	≤ 1

- (i) In order to limit bromate formation, Suppliers should target to maintain bromide ion concentration in their systems to less than 0.05 mg/l and sample according to the same sampling frequency of bromate for the purpose of test verification.
- (ii) The sum of detected concentration of Chloroform, Bromodichloromethane (BDCM), Dibromochloromethane (DBCM) and Bromoform as calculated according to the equation below.

$$\text{Total Trihalomethanes} = \frac{\text{C Bromoform}}{\text{PCV Bromoform}} + \frac{\text{C DBCM}}{\text{PCV DBCM}} + \frac{\text{C BDCM}}{\text{PCV BDCM}} + \frac{\text{C Chloroform}}{\text{PVC Chloroform}} \leq 1$$

C = Measured Concentration in mg/ l

PCV = Prescribed Concentration or Value in mg/ l

Schedule 2

Sampling Frequencies

Schedule 2: Sampling frequencies

2

Sampling Frequency Requirements

Regulated Activity	Relevant sampling testing criteria	
	Schedule I	Schedule II
Water Production by Thermal Desalination	Table A,B,C,F & H	Table 3 & 7
Water Production by Hybrid (Thermal and Membrane or Membrane only)	Table A,B,C,E,F & H	Table 4 & 7
Water Abstracted from Well Fields	Table A,B,C,D,E, F & H	Table 5
Water Transmission	Table A,B,C,F & H (Table E: in case of GRP)	Table 2 & 7
Water Distribution	Table A,B,C,E,F,G & H	Table 1 & 7
Water Tankers	Table A,C & F (Table E: in case of internal coating)	Table 6

Table 1 - Sampling frequencies at distribution supply points to consumers

Water Supply Zone or Combination of Zones		Sampling frequency (number per annum)					
Volume distributed (m ³ /d)	Population supplied	Table A Parameters			Table B Parameters		
		Reduced	Standard	Increased	Reduced	Standard	Increased
≤100	≤500	2	4	8	1	2	3
101- 1,000	501- 5,000	3	6	12	1	2	3
1,001- 2,000	5,001- 10,000	6	12	24	3	4	6
2,001-4,000	10,001- 20,000	12	24	48	3	4	6
4,001-10,000	20,001-50,000	18	36	72	6	8	12
10,001-20,000	50,001-100,000	18	48	72	6	10	12
>20,000	>100,000	18	48	72	6	10	12
Volume distributed (m ³ /d)	Population supplied	Table C Parameters			Table D Parameters		
		Reduced	Standard	Increased	Reduced	Standard	Increased
≤100	≤500	2	3	4			
101- 1,000	501- 5,000	2	3	4			
1,001- 2,000	5,001- 10,000	3	4	6			
2,001- 4,000	10,001- 20,000	3	4	6			
4,001-10,000	20,001-50,000	4	6	8			
10,001-20,000	50,001-100,000	4	6	8			
>20,000	>100,000	6	8	10			

Continued (Table 1)

Volume distributed (m ³ /d)	Population supplied	Table E Parameters			Table F Parameters		
		Reduced	Standard	Increased	Reduced	Standard	Increased
≤100	≤500	1	2	3	6	12	24
101- 1,000	501- 5,000	1	2	3	6	12	24
1,001- 2,000	5,001- 10,000	2	3	4	12	24	48
2,001- 4,000	10,001- 20,000	2	3	4	12	24	48
4,001-10,000	20,001-50,000	3	4	6	18	36	72
10,001-20,000	50,001-100,000	3	4	6	18	36	72
>20,000	>100,000	4	6	8	36	48	72
Volume distributed (m ³ /d)	Population supplied	Table G Parameters			Table H Parameters		
		Reduced	Standard	Increased	Reduced	Standard	Increased
≤100	≤500	1	2	3	3	6	24
101- 1,000	501- 5,000	1	3	3	3	6	24
1,001- 2,000	5,001- 10,000	2	3	4	6	9	48
2,001- 4,000	10,001- 20,000	2	3	4	6	9	48
4,001-10,000	20,001-50,000	3	6	8	9	12	48
10,001-20,000	50,001-100,000	3	6	8	9	12	48
>20,000	>100,000	3	6	8	9	12	48

Table 2 - Frequencies at main pump station exit lines and connection supply points (trans.)

Water pumping capacity	Sampling frequency (number per annum)					
Capacity (m ³ /d)	Table A Parameters			Table B Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
≤100	2	4	8	2	4	8
101- 1,000	3	6	12	2	4	8
1,001- 4,000	6	12	24	2	4	8
4,001- 10,000	6	12	24	3	6	12
10,001-20,000	12	24	48	3	6	12
20,001-30,000	12	24	48	3	6	12
30,001-60,000	18	36	72	3	6	12
60,001-100,000	18	36	72	3	6	12
>100,000	24	48	96	6	12	24
Capacity (m ³ /d)	Table C Parameters			Table D Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
≤100	2	4	8			
101- 1,000	2	4	8			
1,001- 4,000	2	4	8			
4,001- 10,000	2	4	8			
10,001-20,000	3	6	12			
20,001-30,000	3	6	12			
30,001-60,000	3	6	12			
60,001-100,000	6	12	24			
>100,000	6	12	24			

Continued (Table 2)

Capacity (m ³ /d)	Table E(i) Parameters			Table F Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
≤100	1	1	2	2	4	8
101- 1,000	1	1	2	2	4	8
1,001- 4,000	1	1	2	2	4	8
4,001- 10,000	1	1	2	3	6	12
10,001-20,000	1	2	4	6	12	24
20,001-30,000	2	2	4	6	12	24
30,001-60,000	2	2	4	12	24	48
60,001-100,000	2	4	6	12	24	48
>100,000	2	4	6	18	36	72
Capacity (m ³ /d)	Table G Parameters			Table H Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
≤100				1	3	6
101- 1,000				1	3	6
1,001- 2,000				6	12	24
2,001- 4,000				6	12	24
4,001-10,000				6	12	24
10,001-20,000				6	12	24
20,001-30,000				6	12	24
30,001-60,000				6	12	24
>60,000				6	12	24

(i) In situations where GRP pipes are used in water supply systems.

Table 3 - Sampling frequencies at desalination plants connection points by thermal desalination processes (Multi Stage Flash, Multi Effect Distillation, Solar, Thermal Vapor Compression)

Plant rated capacity	Sampling frequency (number per annum)					
Capacity (m ³ /d)	Table A Parameters			Table B Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
≤1,000	12	36	48	2	4	8
1,000-10,000	15	30	60	3	6	12
10,001-20,000	30	60	240	3	6	12
20,001-50,000	60	120	240	6	12	24
50,001-100,000	60	180	240	6	12	24
100,001-200,000	180	240	360	12	24	48
200,001-300,000	240	360	720	12	24	48
300,001-500,000	240	360	720	18	36	72
>500,000	240	360	720	18	36	72
Capacity (m ³ /d)	Table C Parameters			Table D Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
	2	4	8			
1,000-10,000	2	4	8			
10,001-20,000	2	4	8			
20,001-50,000	2	4	8			
50,001-100,000	3	6	12			
100,001-200,000	3	6	12			
200,001-300,000	3	6	9			
300,001-500,000	6	9	12			
>500,000	6	9	12			

Continued (Table 3)

Capacity (m ³ /d)	Table E Parameters			Table F Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
≤1,000				2	4	8
1,001-10,000				2	4	8
10,001-20,000				2	4	8
20,001-50,000				3	6	8
50,001-100,000				3	6	12
100,001-200,000				3	6	12
200,001-300,000				5	12	20
300,001-500,000				12	24	40
>500,000				24	36	48
Capacity (m ³ /d)	Table G Parameters			Table H Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
≤1,000				2	4	8
1,001-10,000				6	12	24
10,001-20,000				6	12	24
20,001-50,000				12	24	48
50,001-100,000				12	24	48
100,001-200,000				12	24	48
200,001-300,000				12	24	48
300,001-500,000				12	24	48
>500,000				12	24	48

Table 4 - Sampling frequencies at desalination plants connection points by electrically/ mechanically/ chemically driven desalination processes or membrane systems

Plant capacity	Sampling frequency (number per annum)					
Capacity (m ³ /d)	Table A Parameters			Table B Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
≤1,000	12	36	48	2	4	8
1,000-10,000	15	30	60	3	6	12
10,001-20,000	30	60	240	3	6	12
20,001-50,000	60	120	240	6	12	24
50,001-100,000	60	180	240	6	12	24
100,001-200,000	180	240	360	12	24	48
200,001-300,000	240	360	720	12	24	48
300,001-500,000	240	360	720	18	36	72
>500,000	240	360	720	18	36	72
Capacity (m ³ /d)	Table C Parameters			Table D Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
≤1,000	2	4	8			
1,000-10,000	2	4	8			
10,001-20,000	2	4	8			
20,001-50,000	2	4	8			
50,001-100,000	3	6	12			
100,001-200,000	3	6	12			
200,001-300,000	3	6	9			
300,001-500,000	6	9	12			
>500,000	6	9	12			

Continued (Table 4)

Capacity (m ³ /d)	Table E Parameters			Table F Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
≤1,000	2	4	8	2	4	8
1,000-10,000	2	4	8	2	4	8
10,001-20,000	2	4	8	2	4	8
20,001-50,000	2	4	8	3	6	8
50,001-100,000	3	6	12	3	6	12
100,001-200,000	3	6	12	3	6	12
200,001-300,000	3	6	12	5	12	20
300,001-500,000	6	12	24	12	24	40
>500,000	6	6	24	24	36	48
Capacity (m ³ /d)	Table G Parameters			Table H Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
≤1,000				2	4	8
1,000-10,000				6	12	24
10,001-20,000				6	12	24
20,001-50,000				9	18	36
50,001-100,000				9	18	36
100,001-200,000				9	18	36
200,001-300,000				12	24	48
300,001-500,000				12	24	48
>500,000				12	24	48

Remarks: In case of Hybrid Plants (thermal and membrane) Table 4 sampling frequency criteria should be followed.

Table 5 - Sampling frequencies at well field connection points

Production capacity	Sampling frequency (number per annum)					
Capacity (m ³ /d)	Table A Parameters			Table B Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
≤100	2	4	8	2	4	8
101- 1,000	3	6	12	2	4	8
1,001- 2,000	6	12	24	2	4	8
2,001- 4,000	12	24	48	3	6	12
4,001-10,000	30	60	120	3	6	12
10,001-20,000	30	60	120	6	12	24
Capacity (m ³ /d)	Table C Parameters			Table D Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
≤100	2	4	8	1	1	2
101- 1,000	2	4	8	1	2	4
1,001- 2,000	3	6	12	3	6	12
2,001- 4,000	3	6	12	3	6	12
4,001-10,000	6	12	24	6	12	24
10,001-20,000	12	24	36	6	12	24
Capacity (m ³ /d)	Table E Parameters			Table F Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
≤100	2	4	8	2	4	8
101- 1,000	2	4	8	2	4	8
1,001- 2,000	2	4	8	2	4	8
2,001- 4,000	4	6	12	3	6	12
4,001-10,000	4	6	12	6	12	24
10,001-20,000	8	12	24	12	24	48
Capacity (m ³ /d)	Table G Parameters			Table H Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
≤100				6	12	24
101- 1,000				6	12	24
1,001- 2,000				12	24	48
2,001- 4,000				12	24	48
4,001-10,000				12	24	48
10,001-20,000				12	24	48

Table 6 - Sampling frequencies for water tankers

Tanker's capacity / size	Sampling frequency (number per annum)					
	Table A Parameters			Table B Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
For all sizes	1	2	4			
Tanker's capacity / size	Table C Parameters			Table D Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
For all sizes	1	2	4			
Tanker's Capacity / Size	Table E (i) Parameters			Table F Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
For all sizes	1	2	4	1	2	4
Tanker's Capacity / Size	Table G Parameters			Table H Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
For all sizes						

- (i) Tankers internally coated (paint) are required to test for TOC and relevant parameters from Table E (1, 2 Dichloroethane, Toluene, Benzo(a)pyrene, Vinyl Chloride) as minimum.

Table 7 - Sampling frequencies for potable water storage tanks, reservoir and water towers (water body)

Per water body	Sampling frequency (number per annum)					
Capacity in (m ³)	Table A Parameters			Table B Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
<2,000	2	2	8			
2,000-10,000	2	2	8			
10,001-50,000	2	3	9			
50,001-200,000	3	4	9			
>200,000	4	6	12			
Capacity in (m ³)	Table C Parameters			Table D Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
<2,000						
2,000-10,000						
10,001-50,000						
50,001-200,000						
>200,000						
Capacity (m ³ d)	Table E Parameters			Table F Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
<2,000				2	2	8
2,000-10,000				2	2	8
10,001-50,000				2	3	9
50,001-200,000				3	4	9
>200,000				4	6	12
Capacity (m ³)	Table G Parameters			Table H Parameters		
	Reduced	Standard	Increased	Reduced	Standard	Increased
<2,000						
2,000-10,000						
10,001-50,000						
50,001-200,000						
>200,000						

Schedule 3

Forms (A&B)

Distribution system

Month		Year	
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[illegible]

Water transmission system as well as pumping station and reservoirs

Month		Year	
-------	--	------	--

[illegible]

***P/S:** Pumping Station
****Reservoir:** Storage Tank or Water Body

Water production plant or well field

Month		Year	
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[illegible]

Applied tests according to the sampling frequency in schedule 2

Month		Year	
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[illegible]

Applied test: The number of tests required per annum to be carried out by the Licensed Supplier under the relevant table in Schedule 2.

Schedule 4

Drinking Water Performance Indices to Network Companies

Schedule 4: Drinking water performance

4

Distribution Performance Index

- Disinfection & Disinfection By-Product Control Index (DCI) according to Table 1 of Schedule 2

Parameter	Required tests according to schedule 2	Done	Failed	Passed
Residual Cl ₂				
Bromate				
THM's				
Coliforms				
E.Coli				
Total	A			B

$$DCI = \frac{\text{Total Passed}}{\text{Total Required}} \times 2.5 = \frac{B}{A} \times 2.5 \quad (DCI \text{ is weighted } 2.5)$$

- Reservoirs Integrity Index (RII) according to Table 7 of Schedule 2

Parameter	Required tests according to schedule 2	Done	Failed	Passed
Residual Cl ₂				
Total bacterial count				
Coliforms				
Total	C			D

$$RII = \frac{\text{Total Passed}}{\text{Total Required}} \times 1 = \frac{D}{C} \times 1 \quad (RII \text{ is weighted } 1)$$

- Distribution Maintenance Index (DMI) according to Table 1 of Schedule 2

Parameter	Required tests according to schedule 2	Done	Failed	Passed
Colour				
Turbidity				
Odour				
Taste				
pH				
Iron				
Copper				
Manganese				
Total	E			F

$$DMI = \frac{\text{Total Passed}}{\text{Total Required}} \times 1.5 = \frac{F}{E} \times 1.5 \quad (DMI \text{ is weighted } 1.5)$$

The WQP for Distribution Performance Index is:

$$(\text{Water Quality Performance}) \text{ WQP} = \text{DCI} + \text{RII} + \text{DMI}$$

Transmission Performance Index:

- Disinfection & Disinfection By-Product Control Index (DCI) according to Table 2 of Schedule 2

Parameter	Required tests according to schedule 2	Done	Failed	Passed
Residual Cl ₂				
Bromate				
Coliforms				
E.Coli				
Total	A			B

$$DCI = \frac{\text{Total Passed}}{\text{Total Required}} \times 2.5 = \frac{B}{A} \times 2.5 \quad (DCI \text{ is weighted } 2.5)$$

- Reservoirs Integrity Index (RII) according to Table 7 of Schedule 2

Parameter	Required tests according to schedule 2	Done	Failed	Passed
Residual Cl ₂				
Total bacterial count				
Coliforms				
Total	C			D

$$RII = \frac{\text{Total Passed}}{\text{Total Required}} \times 1 = \frac{D}{C} \times 1 \quad (RII \text{ is weighted } 1)$$

- Transmission Maintenance Index (TMI) according to Table 2 of Schedule 2

Parameter	Required tests according to schedule II	Done	Failed	Passed
Turbidity				
pH				
Iron				
Copper				
Manganese				
Total	E			F

$$\text{TMI} = \frac{\text{Total Passed}}{\text{Total Required}} \times 1.5 = \frac{F}{E} \times 1.5 \quad (\text{TMI is weighted 1.5})$$

The WQP for Transmission Performance Index is:

$$(\text{Water Quality Performance}) \text{ WQP} = \text{DCI} + \text{RII} + \text{TMI}$$

Regulation and Supervision Bureau
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The Water Quality Regulations Revision3