



Kementerian Kesihatan Malaysia

NATIONAL STANDARD FOR DRINKING WATER QUALITY

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Preface

Access to safe drinking water is a basic need and is important to health and development issues at national, regional and local levels. Therefore, efforts need to be taken to ensure that the drinking water supply is safe to use.

The Engineering Services Division, Ministry of Health Malaysia has developed a guideline for drinking water since 1983 when in the same year, the National Guidelines for Drinking Water Quality was published. Throughout the years, some revisions have been made and the revised edition of the National Standard for Drinking Water Quality was published in December 2000, followed by the Second Version in January 2004.

The National Standard for Drinking Water Quality is subjected to a continuous revision process. Therefore in 2022, due to the new scientific evidences and chemicals found in drinking water, the Engineering Services Division once again reviewed the standard to incorporate the first and second addenda of the WHO Guidelines for Drinking Water, Fourth Edition. Literature searches were also performed and drinking water quality guidelines of various countries were thoroughly referred and compared. This latest revision of the National Standard for Drinking Water Quality will also introduce new parameters based on findings of recent, emerging contaminants. The guideline will be periodically reviewed to keep up with the latest aspects and parameters contributing to the drinking water quality.

The Water Engineering and Sanitation Sector, Engineering Services Division, Ministry of Health Malaysia is indebted to the members of the technical and expert committee for their contribution and input in reviewing and revising the National Drinking Water Quality Standards, 2023. This guideline is expected to significantly contribute to improving and protecting the public health of all Malaysian.

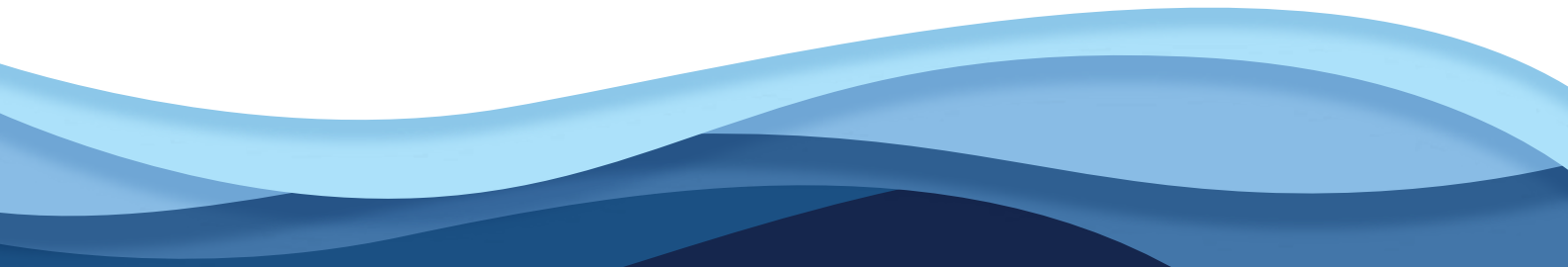


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LIST OF ABBREVIATIONS

Abbreviation	Description
MOH	Ministry of Health
DWQSU	Drinking Water Quality Surveillance Unit
WHO	World Health Organization
DOC	Department of Chemistry
DOE	Department of Environment

1. INTRODUCTION

- 1.1 Clean and safe water is essential for life. Water used for drinking and domestic use should meet safety standards and display aesthetically appealing characteristics. The Malaysian National Standard for Drinking Water Quality is intended to set numerical “guideline values” for constituents of water and to outline the frequency of monitoring programs. The Standard also describes the recommended procedures as a guide for relevant authorities to achieve drinking water quality standards. This Standard is published after due consideration of the most recent information.
- 1.2 This document is divided into the following sections;
- (i) Definition of terms,
 - (ii) Quality requirements, and
 - (iii) Recommended procedures.
- 1.3 The recommended raw water quality criteria included in this document is intended to assist users in determining the appropriate treatment needed for raw water in order to produce water that will conform with the drinking water quality standards. The possible users include;
- (i) Water Authorities
 - (ii) Ministry of Health (MOH)
 - (iii) Department of Chemistry (DOC)
 - (iv) Department of Environment (DOE)
 - (v) Public Organizations
 - (vi) Private Organizations
 - (vii) Drinking Water Supplier
 - (viii) Other Agencies
- 1.4 The drinking water quality standards are applicable to all water intended for human consumption. This includes drinking water from all public water supply systems, private water supply systems, internal water reticulation systems in buildings, and drinking water transporters.
- 1.5 The 4th edition of WHO Guidelines for Drinking Water Quality, incorporating the First and Second Addenda, 2022 were used as the main reference for this Standard. Those interested in the rationale behind the derivation of recommended standard values should refer to the guideline.

2. DEFINITION OF TERMS

- 2.1 **Conventional Treatment** includes the following water treatment processes namely screening, straining, aeration, coagulation and flocculation, sedimentation, filtration, disinfection, and fluoridation.
- 2.2 **Drinking Water** means water for human consumption or for purposes connected with human usage excluding any water or drink regulated under the Food Act 1983 [Act 281] or any regulations made thereunder.
- 2.3 **Drinking Water Supplier** shall mean the waterworks or any person or agency supplying water to the public or private, including drinking water distributor in Sabah and Sarawak.
- 2.4 **Drinking Water Transporter** means a person who provides the services to transport or supply drinking water by any vehicle other than private vehicle.
- 2.5 **Drinking Water Quality Standards** sets out the maximum acceptance levels of characteristics and constituents in drinking water necessary to ensure maximum protection of the health and well-being of the consumer. Most of these levels are based on the 4th edition of the WHO Drinking Water Quality Guidelines, 2022.
- 2.6 **Private Water Supply System** means a water supply system which is used solely for the purposes of supplying water to the owner or the occupier of a premise or the guests or invitees of the owner or occupier for their private use.
- 2.7 **Public Water Supply System** means a water supply system which is used solely for the purposes of supplying water to the public that either;
- (i) has 15 or more service connections, or
 - (ii) regularly serve an average of 25 or more people daily for at least 60 days each year.
- 2.8 **Raw Water** refers to water in its natural state, prior to any treatment for drinking.
- 2.9 **Recommended Raw Water Criteria** sets out the maximum acceptance levels of characteristics and constituents in raw water, which, if exceeded, will require special treatment. For raw water with constituents whose level of concentration is below the recommended criteria, only conventional water treatment is necessary.

- 2.10 **Referral** consists of parameters or substances that are absent of specific guidelines and have raised concerns within the public or the scientific community due to their potential presence in water meant for human consumption, which could potentially endanger human health. When a parameter or condition in water exceeds established standards or poses a potential risk to human health or the environment, it may be referred for more in-depth assessment and management.
- 2.11 **Special Treatment** includes the following additional unit water treatment process namely, pre-sedimentation, pre-disinfection, activated carbon adsorption, ion exchange, reverse osmosis, electrodialysis, fluoridation, etc.
- 2.12 **Water Authorities** shall mean the Public Works Department, Water Supply Department, the Water Board, privatized or corporatized water authority or organization.
- 2.13 **Water Supply System** means the whole of a system incorporating public mains, pipes, chambers, treatment plants, pumping stations, service or balancing reservoirs or any combination thereof and all other structures, installations, buildings, equipment and appurtenances used and the lands where the same are located for the storage, abstraction, collection, conveyance, treatment, distribution and supply of water.

3. QUALITY REQUIREMENTS

3.1 Group Classification

The parameters in this standard are categorized into five groups:

- Group I : Physical and microbiological,
- Group II : Inorganic chemicals,
- Group III : Heavy metals,
- Group IV : Pesticides and organic substances, and
- Group V : Radioactivity.

3.2 Recommended Raw Water Quality Criteria

3.2.1 Table 1, Column I presents the recommended criteria for parameters in Group I-V of raw water which will be suitable as a potable source after undergoing conventional treatment.

3.2.2 If a raw water source has a quality that conforms to the recommended standards set in the drinking water quality standards as listed in Table 2, Column I, then it can be supplied with minimal treatment, which in most cases involves disinfection only.

3.2.3 If a raw water source has a quality that does not conform to the recommended raw water quality criteria, then appropriate action shall be taken to identify and overcome the problem to allow for continued operation of conventional treatment. Special treatment should only be considered as a last resort.

3.3 Drinking Water Quality Standards

3.3.1 Drinking water must be clear, and does not have objectionable taste, colour and odour. It must be pleasant to drink and free from all harmful organisms, chemical substances and radionuclides, in amounts which could constitute a hazard to the health of the consumer.

3.3.2 The quality of drinking water is measured in terms of its microbiological, physical, chemical and radioactivity characteristics. Table 2 lists some of these characteristics and constituents with their maximum acceptable values, which shall not be exceeded for maximum protection of the consumer.

3.3.3 If the characteristics or constituents in water after repeated sampling exceed the maximum acceptable values listed in Table 2, then it shall be investigated immediately by MOH and the drinking water supplier to ascertain the cause and to remove the source of contamination. If these measures fail repeatedly, the public shall be notified, and alternative sources of supply should be sought.

3.3.4 More attention is to be given to parameters relating to the bacteriological quality, chemical toxicity and residual chlorine of the water as listed in Table 2.

3.4 Expression of Results

3.4.1 Results of chemical analysis shall be expressed in terms of milligrams per litre (mg/l) or parts per million (ppm). In some cases, reporting of chemical analysis will be expressed by parts per billion (ppb).

3.4.2 Turbidity shall be expressed in Nephelometric Turbidity Units (NTU).

3.4.3 Colour shall be expressed in units based on the platinum cobalt scale, reported in TCU (True Colour Units).

3.4.4 Volume shall be expressed in milliliters or litre (ml or l).

3.4.5 Temperature shall be expressed in degree centigrade (°C).

3.4.6 Radioactivity shall be expressed in Becquerel/litre (Bq/l).

3.4.7 Conductivity shall be expressed in Microsiemens per centimetre ($\mu\text{S}/\text{cm}$).

3.4.8 For microorganisms, estimation of bacteria shall be given in terms of Most Probable Number per 100ml (MPN/100ml) for the multiple-tube fermentation method and in colonies per 100ml (cfu/100ml) for the membrane filter method.

3.4.9 In reporting results of chemical analysis, the accuracy and precision of the method shall be indicated whenever possible. This includes the proper use of significant figures and the indication of confidence limits.

4. PROCEDURES RECOMMENDED TO ACHIEVE THE DRINKING WATER QUALITY STANDARDS

4.1 Protection of Source

- 4.1.1 The quality of wastewater discharges upstream of water supply sources shall conform to the standard A levels listed in the Environmental Quality (Sewage) Regulations 2009 and Environmental Quality (Industrial Effluent) Regulations 2009.
- 4.1.2 In the case of parameters not listed under Standard A stated in 4.1.1, the parameter limits listed in the Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Regulations 1978 and Environmental Quality (Designated Premises) (Crude Palm Oil) Regulations 1977 shall be used as a guide to determine the discharge standard for control and enforcement purposes. Reference should be made to the latest edition.
- 4.1.3 The responsibility for the protection of the intake shall be with the drinking water supplier while the preservation of the raw water quality of the source is within the jurisdiction of the DOE with joint responsibility and cooperation of other agencies such as the Department of Agriculture, Veterinary Department, Local Authorities, Land and Mines Department, etc.
- 4.1.4 The MOH, DOE and other relevant agencies shall be informed of all sources of new public water supplies.
- 4.1.5 Monitoring of water sources shall be carried out regularly to detect any deterioration in raw water quality and its impact on the treatment plant concerned. This monitoring of raw water quality shall be carried out in conjunction with sanitary surveys.

4.2 Preventive Measures

- 4.2.1 Water treatment plants must be well designed and maintained; and upgraded if necessary, in order to prevent and minimize operation deficiencies or functional failures, which may lead to the production of unsatisfactory water.

4.2.2 Service reservoirs must be designed, constructed, maintained, and adequately protected to minimize contamination from human and animal activities.

4.2.3 When designing, constructing, or maintaining a distribution system, special consideration must be given to ensure that the distribution system does not become a contamination source and pipe material and fittings are relatively inert to the water conveyed.

4.2.4 The responsibility of maintaining water quality within the private premises must be borne by the occupier of the premises.

4.3 Treatment

4.3.1 When the raw water quality at the intake of a supply exceeds the recommended criteria listed in Table 1, Column I, special treatment of water is required to ensure satisfactory sanitary quality.

4.3.2 Where applicable, the methods of treatment shall include screening, aeration, coagulation and flocculation, sedimentation, filtration, disinfection, pH correction, fluoridation, or any other physical or chemical process or any combination thereof that may be required.

4.3.3 The drinking water supplier is required to engage qualified and competent personnels for carrying out plant operation and maintenance. They are to maintain proper records and ensure plant safety and cleanliness.

4.3.4 The following tests are required for process control: jar test, pH, colour, turbidity, residual chlorine, residual aluminium and fluoride, and shall be carried out within the treatment plant.

4.3.5 The above-mentioned tests shall be carried out by plant operators who are trained by a chemist or a qualified laboratory staff. In the case of rural water supplies, there should be at least one trained plant operator.

4.4 Sanitary Survey

4.4.1 Sanitary survey is an on-site inspection and evaluation of all conditions, devices and practices in the water supply system that pose or could pose a danger to the health and well-being of the consumer.

4.4.2 Sanitary surveys for each treatment plant shall be undertaken on a regular basis (preferably once a year) by personnel from the drinking water suppliers and the MOH who shall also act as the coordinator. Where necessary, personnel from the DOE or any other relevant agency shall provide assistance and cooperation.

4.4.3 In addition, sanitary surveys shall also be conducted;

- (i) When new sources are being developed.
- (ii) When repeated laboratory analysis of a water sample yield results exceeding the recommended maximum acceptable values.
- (iii) When there is an outbreak of waterborne diseases.
- (iv) When there is a significant change of events that could affect the water quality (e.g., beginning of a rainy season, new development in a catchment, etc.)

4.4.4 The survey may be partial or complete depending on circumstances.

4.5 Monitoring

4.5.1 Design of Monitoring Programme

4.5.1.1 The monitoring programme shall be designed so that any temporal variations, both systematic and random, in the quality of the water can be detected, and it should ensure that data collected are representative of the water quality throughout the whole system.

4.5.1.2 The monitoring programme shall be in accordance with the defined methods as prescribed by the MOH. Table 1, Column III and Table 2, Column III list the recommended frequency for each parameter for raw and drinking water, respectively. However, the selection of parameters to be monitored shall be based on the availability of resources as well as the analytical capability of the relevant agencies.

4.5.2 Sample Size

The minimum number of samples for bacteriological sampling per month in accordance with the United States Environmental Protection Agency shall be adopted here as a guide to determine the total number of samples required monthly for a water supply system (see Table 4).

4.5.3 Sample Locations

Sample(s) shall be taken from points in the water supply system which are as representative as possible of that supply. This shall include points at the intake, the treatment plant outlet, the reservoir outlet, the main pipeline as well as the rest of the distribution, inclusive of the consumer's tap.

4.5.4 In-situ Analysis

All field-testing kits must be standardized, where required with the MOH, before being put into use. The application methods of the field test kits shall be followed in detail as recommended by the manufacturer. All equipment used for the analysis must be in good condition and calibrated. The physical parameters to be measured in-situ include pH, turbidity, residual chlorine and colour.

4.5.5 Sampling Procedures

4.5.5.1 Samples shall be collected in either glass, plastic bottles or thio bags with the appropriate pre-treatment (such as additives and sterilization) (See Table 5). Appropriate sampling devices shall be employed for the sampling of water especially from lakes, reservoirs and wells. Great care shall be taken during sampling and transport of the sample in order to prevent contamination or change in composition. The volume of water collected shall be sufficient for the required analysis.

4.5.5.2 The sample(s) shall be placed in a sturdy box, packed with ice and kept away from direct sunlight at a constant temperature (4 – 10°C) or depending on the type of sample and the test for despatch. It is essential to prevent any potential contamination of the box and sample(s).

4.5.5.3 The sample box shall be sealed and remain so until they are opened for analysis at the laboratory. The sample box shall reached the laboratory as quickly as possible.

4.5.6 Laboratory Procedures

4.5.6.1 The water samples must be attended to immediately when they reach the laboratory.

4.5.6.2 All water samples upon reaching the laboratory shall be analyzed as soon as possible. Bacteriological samples shall be examined within 24 hours after collection. Other parameters shall be measured at the laboratory preferably not exceeding 72 hours after collection, provided the samples are preserved appropriately (see Table 5).

4.6 Reporting of Results, Record Keeping and Data Evaluation

4.6.1 Reporting of Results

4.6.1.1 Upon completion of tests on the sample, all results shall be reported and be signed by the analyst. In the case of field testing, results shall be reported immediately in the monthly summary report by the Assistant Environmental Health Officer/Environmental Health Officer.

4.6.1.2 Routine samples with results exceeding the maximum acceptable values for bacteria (Table 2) shall be reported immediately by the analyst by telephone or email to the following agencies;

- (i) The affected drinking water supplier, or in the case of Water Authorities, the state office, who shall then inform by telephone or email the district office and by writing to the Federal Water Authorities.
- (ii) The State Health Office, who shall then immediately inform, by telephone, the District Health Office and by writing to the Drinking Water Quality Surveillance Unit, MOH.

4.6.1.3 Routine samples with results exceeding the maximum acceptable values for chemical parameters shall be reported within 14 days of collection to the following agencies;

- (i) The drinking water supplier, or in the case of the Water Authorities, the district office, who shall inform by writing, to the State and Federal Authorities.
- (ii) The District Health Office, who shall then inform by writing, to the State Health Department.

4.6.1.4 For a routine sample with normal results, it shall be reported within 30 days of collection to the following agencies;

- (i) The drinking water supplier concerned; or in the case of the Water Authorities, the district office.
- (ii) The District Health Office, who shall then send a monthly summary to the State Health Department.

4.6.2 Record Keeping

4.6.2.1 Monthly summary reports sent by the District Health Offices shall be compiled and sent to the Drinking Water Quality Surveillance Unit, MOH, by the State Health Department. All data pertaining to drinking water quality shall be retained, analyzed and filed for as long as they may be useful (minimum of five years).

4.6.2.2 The maintenance of accurate and complete records shall be an integral part of the surveillance of drinking water quality. Apart from the recording of analytical results, the following shall also be recorded;

- (i) Information on construction and location of the water supply and its auxiliary structures,
- (ii) Details of treatment, operation, and maintenance,
- (iii) Sanitary survey reports, and
- (iv) Reports on corrective actions taken.

4.6.2 Data Evaluation

All records and data should be used in evaluating system performance and planning improvements.

4.7 Remedial Action Procedures

Upon receiving reports of violations to the maximum acceptable values in drinking water, the District Health Office shall liaise with the Water Authorities or the drinking water supplier concerned to investigate the probable cause. The line of action may involve one or a combination of the following procedures;

- (i) Re-sampling the affected area.
- (ii) Carrying out a sanitary survey (if necessary).
- (iii) Carrying out a detailed engineering system investigation.
Assistance may be sought from the state or federal agencies (if necessary).

Following the investigations carried out, the remedial actions that may be recommended may involve one or a combination of the following procedures;

- (i) Flushing of the pipelines or service reservoirs.
- (ii) Increased chlorine dosage.
- (iii) Correction of chemical dosage.
- (iv) Use of alternative source(s) of water.
- (v) Major correction measures undertaken based on findings of engineering investigation.
- (vi) Notification and advice to the public.
- (vii) Terminating the supply.

4.8 Examination of Staff Employed by Waterworks

- 4.8.1 Care should be exercised in the selection of waterworks staff/personnel as well as contractors and their staff who are to be employed in jobs where a risk to the safety of the water supply is likely to arise. The clinical history of each person, particularly with reference to any infection capable of being waterborne, should be thoroughly investigated.
- 4.8.2 Individual medical records for every plant operator and contractor employed in the plant should be maintained for easy reference and follow-up action.
- 4.8.3 He should not be employed unless physical and medical examination shows the absence of infection by waterborne diseases.
- 4.8.4 Information on all vaccinations received by prospective employees must be recorded. Those requiring boosters or other vaccinations not received so far, must be given to the employee if recommended by the Government Medical Officer examining the prospective employee.

- 4.8.5 Information on all vaccinations received by prospective employees must be recorded. Those requiring boosters or other vaccinations not received so far, must be given to the employee if recommended by the Government Medical Officer examining the prospective employee.

If any employee is known to have any clinical signs and symptoms of any waterborne disease (e.g., diarrhea), he is required to be examined and certified fit by a Government Medical Officer before he resumes work at the treatment plant.

- 4.8.6 Standing arrangements should also be made to ensure that each member of the staff is examined every six months and certified fit by the Government Medical Officer.

5. REFERENCES

- APHA, American Public Health Association, Standard methods for the examination of water and wastewater, 22nd edition, American Public Health Association, American Water Works Association, Water Environment Federation, Washington, DC., 2012.
- AUS, Australian Drinking Water Guidelines, 2011.
- EEC, EEC Standard Council Directive (80/778/EEC).
- Environmental Quality Act 1974.
- Environmental Quality (Sewage) Regulations 2009.
- Environmental Quality (Industrial Effluent) Regulations 2009.
- Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Regulations 1978.
- Environmental Quality (Designated Premises) (Crude Palm Oil) Regulations 1977.
- EPA, EPA Drinking Water Health Advisory, 2016.
- EPA, EPA Mirex Nease Chemical Superfund Site, 1992.
- EU, European Union, The Quality of Water Intended for Human Consumption, 2020.
- Food Act 1983, Food Act 1983, amendment 2020.
- Garis Panduan Penghantaran Sampel, Jabatan Kimia Malaysia, Kementerian Sains, Teknologi dan Inovasi, Semakan Mei 2021.
- IS, Indian Standard Drinking Water, second revision, 2012.
- MAL, refers to values adapted for Malaysian conditions.
- NZ, Drinking Water Standards for New Zealand 2005.
- UNECE, United Nations Economic Commission for Europe, 1994.
- Water Services Industry Act 2006.
- WHO 1, International Standards for Drinking-Water, Second Edition, 1963.
- WHO 1, WHO Guidelines for Drinking Water Quality 1984.
- WHO 2, Guidelines for Drinking Water Quality, Vol.2 Health Criteria and Other Supporting Information, 1984.
- WHO 2, Guidelines for Drinking Water Quality, Second Edition, Volume 1, Recommendations, 1993.
- WHO 3, Guidelines for Drinking Water Quality, Third Edition Incorporating the First and Second Addenda, Vol. 1 Recommendations, 2008.
- WHO 4, Guidelines for Drinking Water Quality, Fourth Edition Incorporating the First and Second Addenda, 2022.
- 40 Code of Federal Regulations (CFR) § 141.21, 2022.



Kementerian Kesihatan Malaysia

The Malaysian National Standard for Drinking Water Quality

Table 1	: Recommended Raw Water Quality Criteria and Frequency of Monitoring
Table 2	: Drinking Water Quality Standards and Frequency of Monitoring
Table 3	: Drinking Water Quality Standards and Frequency of Monitoring (Referral)
Table 4	: Minimum Number of Samples for Bacteriological Sampling Per Month
Table 5	: General Sampling and Preservation Procedure

RECOMMENDED RAW WATER QUALITY CRITERIA AND FREQUENCY OF MONITORING

Table 1

NO	PARAMETERS	COLUMN I	COLUMN II	COLUMN III		
		MAXIMUM ACCEPTABLE VALUE mg/l (unless otherwise stated)	SOURCE OF REFERENCE	FREQUENCY TO BE MONITORED		
				SURFACE	GROUND	DIRECT IMPOUNDING
	GROUP I					
1	COLOUR	300 TCU	WHO1	W	M	M
2	pH	5.5 – 9.0	MAL			
3	TOTAL COLIFORM	5,000 MPN/100ml or cfu/100ml	WHO1			
4	TURBIDITY	1,000 NTU	WHO2			
	GROUP II					
1	AMMONIA (as N)	1.5	WHO1	M	Y/4	Y/4
2	ANIONIC DETERGENT MBAS	1.0	WHO1			
3	BIOLOGICAL OXYGEN DEMAND	6	WHO1			
4	CHEMICAL OXYGEN DEMAND	10	WHO1			
5	CHLORIDE	250	MAL			
6	FLUORIDE	1.5	WHO1			
7	HARDNESS	500	MAL			
8	IRON (as Fe)	1.0	MAL			
9	MANGANESE	0.2	WHO1			
10	NITRATE (as N)	10	MAL			
11	TOTAL DISSOLVED SOLIDS	1,500	WHO1			
	GROUP III					
1	ARSENIC	0.01	MAL	Y/4	Y/4	Y/4
2	CADMIUM	0.003	MAL			
3	CHROMIUM	0.05	WHO1			
4	COPPER	1.0	MAL			
5	CYANIDE	0.07	MAL			
6	MAGNESIUM	150	MAL			
7	MERCURY	0.001	MAL			
8	MINERAL OIL	0.3	MAL			
9	LEAD	0.05	MAL			
10	PHENOL	0.002	WHO1			
11	SELENIUM	0.01	WHO1			
12	SILVER	0.05	MAL			
13	SODIUM	200	MAL			
14	SULPHATE	250	MAL			
15	ZINC	3	MAL			

RECOMMENDED RAW WATER QUALITY CRITERIA AND FREQUENCY OF MONITORING

Table 1 (continued)

NO	PARAMETERS	COLUMN I	COLUMN II	COLUMN III		
		MAXIMUM ACCEPTABLE VALUE mg/l (unless otherwise stated)	SOURCE OF REFERENCE	FREQUENCY TO BE MONITORED		
				SURFACE	GROUND	DIRECT IMPOUNDING
	<u>GROUP IV ORGANOCHLORINE PESTICIDES:</u>					
1	ALDRIN/DIELDRIN	0.00003	MAL	Y/4	Y/4	Y/4
2	DDT	0.001	WHO4			
3	HEPTACHLOR & HEPTACHLOR EPOXIDE	0.00003	MAL			
4	METHOXYCHLOR	0.02	MAL			
	<u>NON- ORGANOCHLORINE PESTICIDES:</u>					
5	CHLORDANE	0.0002	MAL	Y/4	Y/4	Y/4
6	HEXACHLOROBENZENE	1	WHO2	WN		
7	LINDANE	0.002	MAL	Y/4		
	<u>HERBICIDES:</u>					
8	DICHLOROPHENOXY- ACETIC ACID	0.03	MAL	WN	Y/4	Y/4
	<u>GROUP V RADIOACTIVITY</u>					
1	GROSS α	0.1Bq/l	MAL	WN	WN	WN
2	GROSS β	1.0Bq/l	MAL			
TOTAL		40 PARAMETERS				

Indicator:

- W : Indicates parameters to be monitored at least once a week.
- M : Indicates parameters to be monitored at least once a month.
- Y : Indicates parameters to be monitored at least once a year.
- Y/2 : Indicates parameters to be monitored at least once in 6 months.
- Y/4 : Indicates parameters to be monitored at least once in 3 months.
- 2Y : Indicates parameters to be monitored at least once in 2 years.
- WN : Indicates parameters to be monitored when necessary.
- WHO1 : Indicates WHO Guidelines for Drinking Water Quality 1984.
- WHO2 : Indicates WHO Guidelines for Drinking Water Quality 1993/96.
- WHO4 : Indicates WHO Guidelines for Drinking Water Quality, Fourth Edition Incorporating the First and Second Addenda, 2022.
- MAL : Indicates values adapted for Malaysian conditions.

Notes:

- The raw water quality criteria provided in this table are designed to help users identify the necessary treatment for raw water, ensuring the production of water that meets drinking water quality standards. Conventional treatment of raw water is suitable if the recommended criteria of parameters in group I-V are met.
- Collection of samples of both raw and treated water for examination for toxic substances should be carried out more frequently if values above the acceptable values are known to be present in the source of supply, or where such potential pollution exists.

DRINKING WATER QUALITY STANDARDS AND FREQUENCY OF MONITORING

Table 2

NO	PARAMETERS	COLUMN I	COLUMN II	COLUMN III			
		MAXIMUM ACCEPTABLE VALUE mg/l (unless otherwise stated)	SOURCE OF REFERENCE	FREQUENCY TO BE MONITORED			
				WATER TREATMENT PLANT OUTLET	SERVICE RESERVOIR OUTLET	DISTRIBUTION SYSTEM	WELL/ SPRING
	GROUP I MICROBIOLOGICAL:						
1	COLIFORM BACTERIA	Must not be detectable (in any) 100 mL sample	WHO4	WN	WN	WN	WN
2	<i>CLOSTRIDIUM PERFRINGENS</i>	Absent in 100mL sample	Food Act 1983				
3	<i>E. COLI</i> OR THERMOTOLERANT	Must not be detectable (in any) 100 mL sample	WHO4	W	W	M	2Y
4	FAECAL STREPTOCOCCI	Membrane filter method: Absent in 100ml sample MPN Method: <1 in 100ml sample	EEC				
5	HELMINTHS	Absent in 100L sample	NZ	WN	WN	WN	WN
6	HETEROTROPHIC PLATE COUNT (HPC)	No values have been set	WHO4				
7	PROTOZOA	Less than one infectious (oo) cyst per 100 L of sample	NZ				
8	TOTAL COLIFORM	Must not be detectable (in any) 100 mL sample	WHO4	W	W	M	2Y
9	VIRUSES (ENTERIC)	No values have been set due to lack of reliable evidence	AUS	WN	WN	WN	WN
	PHYSICAL:						
10	COLOUR	15 TCU	WHO4				
11	COMBINED RESIDUAL CHLORINE	Not less than 1.0	MAL	W	W	M	2Y
12	FREE RESIDUAL CHLORINE	0.2 – 5.0	WHO4				
13	MONOCHLORAMINE	3	WHO4	WN	WN	WN	WN
14	pH	6.5 – 9.0	MAL	W	W	M	2Y
15	TURBIDITY	5 NTU	WHO3				

DRINKING WATER QUALITY STANDARDS AND FREQUENCY OF MONITORING

Table 2 (continued)

NO	PARAMETERS	COLUMN I	COLUMN II	COLUMN III			
		MAXIMUM ACCEPTABLE VALUE mg/l (unless otherwise stated)	SOURCE OF REFERENCE	FREQUENCY TO BE MONITORED			
				WATER TREATMENT PLANT OUTLET	SERVICE RESERVOIR OUTLET	DISTRIBUTION SYSTEM	WELL/ SPRING
	GROUP II INORGANIC:						
1	ALUMINIUM	0.2	WHO4	M	M	Y/2	2Y
2	AMMONIA (as N)	1.5	WHO4				
3	CHLORIDE	250	WHO4				
4	FLUORIDE	0.4 – 0.6	MAL				
5	HARDNESS	500	WHO2				
6	IRON	0.3	WHO4				
7	MANGANESE	0.1	WHO2				
8	NITRATE (as N)	11	WHO4				
9	NITRATE (as NO ₃)	50	WHO4				
10	NITRITE (as NO ₂)	3	WHO4				
11	TOTAL DISSOLVE SOLIDS	1000	WHO4				
	GROUP III						
1	ARSENIC	0.01	WHO4	Y/4	Y/2	Y	2Y
2	CADMIUM	0.003	WHO4				
3	CHROMIUM	0.05	WHO4				
4	COPPER	2	WHO4				
5	CYANIDE	0.17	WHO4				
6	MERCURY (TOTAL)	0.001	WHO2				
7	LEAD	0.01	WHO4				
8	SODIUM	200	WHO4				
9	SULPHATE	250	WHO4				
10	ZINC	3	WHO4				

DRINKING WATER QUALITY STANDARDS AND FREQUENCY OF MONITORING

Table 2 (continued)

NO	PARAMETERS	COLUMN I	COLUMN II	COLUMN III			
		MAXIMUM ACCEPTABLE VALUE mg/l (unless otherwise stated)	SOURCE OF REFERENCE	FREQUENCY TO BE MONITORED			
				WATER TREATMENT PLANT OUTLET	SERVICE RESERVOIR OUTLET	DISTRIBUTION SYSTEM	WELL/ SPRING
	TRICHALOMETHANE:	The sum of the ratio of the concentration to each of the guideline value should not exceed 1.		Y/4	Y/2	Y	2Y
11	CHLOROFORM	0.3	WHO4				
12	BROMOFORM	0.1	WHO4				
13	DIBROMOCHLOROMETHANE	0.1	WHO4				
14	BROMODICHLOROMETHANE	0.06	WHO4				
15	SELENIUM	0.04	WHO4				
16	SILVER	0.1	WHO4				
17	MAGNESIUM	150	MAL				
18	ANTIMONY	0.02	WHO4				
19	BARIUM	1.3	WHO4				
20	BORON	2.4	WHO4				
21	MOLYBDENUM	0.07	WHO4				
22	NICKEL	0.07	WHO4				
23	URANIUM	0.03	WHO4				
24	HYDROGEN SULFIDE	0.05	WHO4				
25	MINERAL OIL	0.5	IS				
26	PHENOL	0.002	WHO1	WN	WN	WN	WN
27	BROMATE	0.01	WHO4				
28	CHLORITE	0.7	WHO4				
29	2-CHLOROPHENOL	0.0001	WHO2				
30	2,4-DICHLOROPHENOL	0.0003	WHO2				
31	2,4,6 -TRICHLOROPHENOL	0.2	WHO4				
32	FORMALDEHYDE	0.9	WHO3				
33	DICHLOROACETIC ACID	0.05	WHO4				
34	TRICHLOROACETIC ACID	0.2	WHO4				
35	CHLORAL HYDRATE (TRICHLOROACETALDEHYDE)	0.01	WHO4				
36	DICHLOROACETO-NITRILE	0.02	WHO4				
37	DIBROMOACETO-NITRILE	0.07	WHO4				
38	TRICHLOROACETO-NITRILE	0.001	WHO3				
39	CYANOGEN CHLORIDE (as CN)	0.07	WHO3				

DRINKING WATER QUALITY STANDARDS AND FREQUENCY OF MONITORING

Table 2 (continued)

NO	PARAMETERS	COLUMN I	COLUMN II	COLUMN III			
		MAXIMUM ACCEPTABLE VALUE mg/l (unless otherwise stated)	SOURCE OF REFERENCE	FREQUENCY TO BE MONITORED			
				WATER TREATMENT PLANT OUTLET	SERVICE RESERVOIR OUTLET	DISTRIBUTION SYSTEM	WELL/ SPRING
	GROUP II INORGANIC:						
1	ALDRIN & DIELDRIN (Combined)	0.00003	WHO4	Y/4			
2	DDT	0.001	WHO4				
3	HEPTACHLOR & HEPTACHLOR EPOXIDE	0.00003	WHO2				
4	METHOXYCHLOR	0.02	WHO4				
5	LINDANE (BHC)	0.002	WHO4				
6	ENDOSULFAN	0.02	AUS				
7	CHLORDANE	0.0002	WHO4				
8	1,2-DICHLOROPROPANE	0.04	WHO3	WN	WN	WN	WN
9	1,3-DICHLOROPROPENE	0.02	WHO2				
10	HEXACHLOROBENZENE	0.001	WHO2				
11	PENTACHLOROPHENOL	0.009	WHO4				
12	ALACHLOR	0.02	WHO4				
13	ALDICARB	0.01	WHO4				
14	AMETRYN	0.07	AUS				
15	ATRAZINE	0.1	WHO4				
16	BENTAZONE	0.5	WHO4				
17	CARBOFURAN	0.007	WHO4				
18	CHLOROTOLURON	0.03	WHO4				
19	CYANAZINE	0.0006	WHO4				
20	2,4-DICHLOROPHENOXY- ACETIC ACID (2,4D)	0.03	WHO4				
21	DIQUAT	0.03	WHO4				
22	1,2-DIBROMO-3- CHLOROPROPANE	0.001	WHO4				
23	1,2-DIBROMOETHANE	0.0004	WHO4				
24	ISOPROTURON	0.009	WHO4				
25	MCPA	0.7	WHO4				
26	METOLACHLOR	0.01	WHO4				
27	MOLINATE	0.006	WHO4				
28	PENDIMETHALIN	0.02	WHO3				
29	PERMETHRIN	0.02	WHO2				
30	PROPANIL	0.02	WHO2				
31	PYRIDATE	0.1	WHO2				
32	SIMAZINE	0.002	WHO4				
33	TRIFURALIN	0.02	WHO4				
34	2,4 DB	0.09	WHO4				
35	DICHLORPROP	0.1	WHO4				
36	FENOPROP	0.009	WHO4				
37	MECOPROP	0.01	WHO4				
38	2,4,5-T	0.009	WHO4				
39	TERBUTHYLAZINE	0.007	WHO4				

DRINKING WATER QUALITY STANDARDS AND FREQUENCY OF MONITORING

Table 2 (continued)

NO	PARAMETERS	COLUMN I	COLUMN II	COLUMN III			
		MAXIMUM ACCEPTABLE VALUE mg/l (unless otherwise stated)	SOURCE OF REFERENCE	FREQUENCY TO BE MONITORED			
				WATER TREATMENT PLANT OUTLET	SERVICE RESERVOIR OUTLET	DISTRIBUTION SYSTEM	WELL/ SPRING
	ORGANIC SUBSTANCES:						
40	CARBON TETRACHLORIDE	0.004	WHO4	WN	WN	WN	WN
41	DICHLOROMETHANE	0.02	WHO4				
42	1,2-DICHLOROETHANE	0.03	WHO4				
43	1,1,1-TRICHLOROETHANE	2	WHO2				
44	VINYL CHLORIDE	0.0003	WHO4				
45	1,1-DICHLOROETHENE	0.03	WHO2				
46	1,2-DICHLOROETHENE	0.05	WHO4				
47	TRICHLOROETHENE	0.02	WHO4				
48	TETRACHLOROETHENE	0.04	WHO4				
49	BENZENE	0.01	WHO4				
50	TOLUENE	0.7	WHO4				
51	XYLENE	0.5	WHO4				
52	ETHYLBENZENE	0.3	WHO4				
53	STYRENE	0.02	WHO4				
54	BENZO (A) PYRENE	0.0007	WHO4				
55	MONOCHLOROBENZENE	0.3	WHO2				
56	1,2-DICHLOROBENZENE	1	WHO4				
57	1,4-DICHLOROBENZENE	0.3	WHO4				
58	TRICHLOROBENZENE (TOTAL)	0.02	WHO2				
59	DI (2-ETHYLHEXYL) ADIPATE	0.08	WHO2				
60	DI (2-ETHYLHEXYL) PHTHALATE	0.008	WHO4				
61	EDETIC ACID (EDTA)	0.6	WHO4				
62	ACRYLAMIDE	0.0005	WHO4				
63	EPICHLOROHYDRIN	0.0004	WHO4				
64	HEXACHLOROBUTADIENE	0.0006	WHO4				
65	MICROCYSTIN-LR	0.001	WHO4				
66	NITRILOTRIACETIC ACID (NTA)	0.2	WHO4				
67	TRIBUTYLTIN OXIDE	0.002	WHO2				
68	CHLORATE	0.7	WHO4				
69	1,4-DIOXANE	0.05	WHO4				
70	MIREX	No values have been set	EPA				

DRINKING WATER QUALITY STANDARDS AND FREQUENCY OF MONITORING

Table 2 (continued)

NO	PARAMETERS	COLUMN I	COLUMN II	COLUMN III			
		MAXIMUM ACCEPTABLE VALUE mg/l (unless otherwise stated)	SOURCE OF REFERENCE	FREQUENCY TO BE MONITORED			
				WATER TREATMENT PLANT OUTLET	SERVICE RESERVOIR OUTLET	DISTRIBUTION SYSTEM	WELL/ SPRING
	GROUP V RADIOACTIVITY:						
1	GROSS α	0.5Bq/l	WHO4	WN	WN	WN	WN
2	GROSS β	1.0Bq/l	WHO4				
TOTAL		137 PARAMETERS					

Indicator:

W	: Indicates parameters to be monitored at least once a week.
M	: Indicates parameters to be monitored at least once a month.
Y	: Indicates parameters to be monitored at least once a year.
Y/2	: Indicates parameters to be monitored at least once in 6 months.
Y/4	: Indicates parameters to be monitored at least once in 3 months.
2Y	: Indicates parameters to be monitored at least once in 2 years.
WN	: Indicates parameters to be monitored when necessary.
WHO1	: Indicates WHO International Standard for Drinking-Water, Second Edition, 1963.
WHO2	: Indicates WHO Guidelines for Drinking Water Quality, Vol. 2 Health Criteria and Other Supporting Information, 1984.
WHO2	: Indicates WHO Guidelines for Drinking Water Quality, Second Edition, Volume 1 Recommendations, 1993.
WHO3	: Indicates WHO Guidelines for Drinking Water Quality, Third Edition Incorporating the First and Second Addenda, Vol.1 Recommendations, 2008.
WHO4	: Indicates WHO Guidelines for Drinking Water Quality, Fourth Edition Incorporating the First and Second Addenda, 2022.
MAL	: Indicates values adapted for Malaysian conditions.
AUS	: Indicates Australian Drinking Water Quality Guidelines, 2011.
EEC	: Indicates EEC Standard Council Directive (80/778/EEC).
IS	: Indicates Indian Standard Drinking Water, second revision, 2012.
NZ	: Indicates Drinking Water Standards for New Zealand 2005.
EPA	: Indicates EPA Mirex Nease Chemical Superfund Site, 1992
Food Act 1983	: Indicates Food Act 1983, amendment 2020.

Notes:

- Any toxic substances not listed shall be deemed as not allowable in drinking water.

DRINKING WATER QUALITY STANDARDS AND FREQUENCY OF MONITORING (REFERRAL)

Table 3

NO	PARAMETERS	COLUMN I	COLUMN II	COLUMN III			
		MAXIMUM ACCEPTABLE VALUE mg/l (unless otherwise stated)	SOURCE OF REFERENCE	FREQUENCY TO BE MONITORED			
				WATER TREATMENT PLANT OUTLET	SERVICE RESERVOIR OUTLET	DISTRIBUTION SYSTEM	WELL/ SPRING
	REFERRAL:						
1	17B-ESTRADIOL	0.000001	EU	WN	WN	WN	WN
2	BISPHENOL A	0.0001	EU				
3	CHLOROBENZENES	0.01	AUS				
4	HYDROXYATRAZINE	0.2	WHO4				
5	MONOCHLOROACETATE	0.02	WHO4				
6	N-NITROSODIMETHYLAMINE	0.0001	WHO4				
7	NONYLPHENOL	0.0003	EU				
8	ODOUR	Unobjectionable	AUS				
9	PETROLEUM OILS (PETROLEUM PRODUCTS)	Acceptable taste and odour	WHO4				
10	TASTE	Unobjectionable	AUS				
11	CHLOROPHYLL	0.0025	UNECE				
12	CONDUCTIVITY	2,500 µS/cm	EU				
13	CHLORPYRIFOS	0.03	WHO4				
14	DIMETHOATE	0.006	WHO4				
15	PFOA	0.00007	EPA				
16	PFOS	0.00007	EPA				
TOTAL		16 PARAMETERS					

Indicator:

- WN** : Indicates parameters to be monitored when necessary.
- WHO4** : Indicates WHO Guidelines for Drinking Water Quality, Fourth Edition Incorporating the First and Second Addenda, 2022.
- AUS** : Indicates Australian Drinking Water Quality Guidelines, 2011.
- UNECE** : Indicates United Nations Economic Commission for Europe, 1994.
- EU** : Indicates European Union, The Quality of Water Intended for Human Consumption, 2020.
- EPA** : Indicates EPA Drinking Water Health Advisory, 2016.

MINIMUM NUMBER OF SAMPLES FOR BACTERIOLOGICAL SAMPLING PER MONTH

Table 4

Population served	Minimum number of samples per month
25 to 1,0001	1
1,001 to 2,500	2
2,501 to 3,300	3
3,301 to 4,100	4
4,101 to 4,900	5
4,901 to 5,800	6
5,801 to 6,700	7
6,701 to 7,600	8
7,601 to 8,500	9
8,501 to 12,900	10
12,901 to 17,200	15
17,201 to 21,500	20
21,501 to 25,000	25
25,001 to 33,000	30
33,001 to 41,000	40
41,001 to 50,000	50
50,001 to 59,000	60
59,001 to 70,000	70
70,001 to 83,000	80
83,001 to 96,000	90
96,001 to 130,000	100
130,001 to 220,000	120
220,001 to 320,000	150
320,001 to 450,000	180
450,001 to 600,000	210
600,001 to 780,000	240
780,001 to 970,000	270
970,001 to 1,230,000	300
1,230,001 to 1,520,000	330
1,520,001 to 1,850,000	360
1,850,001 to 2,270,000	390
2,270,001 to 3,020,000	420
3,020,001 to 3,960,000	450
3,960,001 or more	480

Notes:

- ¹ Includes public water systems which have at least 15 service connections, but serve fewer than 25 persons.

Source:

- 40 Code of Federal Regulations (CFR) § 141.21, 2022.

GENERAL SAMPLING AND PRESERVATION PROCEDURE

Table 5

PARAMETER	SAMPLING CONTAINER	PRESERVATION	HOLDING TIME
Volatile Organic Compounds (VOCs)	Glass bottle (Amber) 100 ml	Add (1+1) HCl to maintain pH<2 No headspace Temperature 4 ± 2°C	7 days after receipt or 14 days after sample preparation with HCl
Heavy Metals	Plastic bottle 50 ml (Filtered)	Add (1+1) HNO ₃ to maintain pH<2 Temperature 4 ± 2°C	6 months for non-volatile metals, 28 days for volatile metals
Nitrate (NO ₃), Phosphate (PO ₄), Sulphate (SO ₄), Chlorine (Cl), Hardness. Total Dissolved Solids (TDS), Na, Ca, K, CO ₃ , HCO ₃	Plastic bottle 2L	Temperature 4 ± 2°C	Hardness – 6 months PO ₄ , NO ₃ – 48 hours SO ₄ , Cl – 28 hours TDS – 7 days
Phenolic Compound	Plastic bottle 2L	pH<2 with H ₂ SO ₄ Temperature 4 ± 2°C	28 days
Pesticides	Glass bottle (Amber) 1000 ml (Filtered)	Add (1+1) HCl pH<2 Temperature 4 ± 2°C	7 days
Bacteria (Total Coliform, Faecal Coliform, <i>E. coli</i>)	Whirl pak (120 ml)	Temperature <10°C	24 hours
TOC	Glass bottle (Amber) 50 mL	pH<2 with H ₂ SO ₄ No headspace Temperature 4 ± 2°C	7 days

Source:

- APHA, American Public Health Association, Standard methods for the examination of water and wastewater, 22nd edition, American Public Health Association, American Water Works Association, Water Environment Federation, Washington, DC, 2012.
- Garis Panduan Penghantaran Sampel, Jabatan Kimia Malaysia, Kementerian Sains, Teknologi dan Inovasi, Semakan Mei 2021.



Kementerian Kesihatan Malaysia

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