10.8 Summary of guideline values

Table 10.9 *Guidelines for microbial quality - monitoring of E. coli (or thermotolerant coliforms)*

Guideline	No sample of drinking water should contain any *E. coli* (or thermotolerant coliforms) (minimum sample 100 mL).
Action	If *E. coli* (or thermotolerant coliforms) are detected, then irrespective of the number of organisms, both the following steps should be taken immediately: 1) Another sample (a repeat sample) should be taken from the same site and from the immediate upstream treated sources of supply and tested for the presence of *E. coli* (or thermotolerant coliforms). – If the additional samples are negative for *E. coli* (or thermotolerant coliforms), then routine sampling can resume, but only after step 2 (below) has been completed. – If any additional sample is positive for *E. coli* (or thermotolerant coliforms), then increased disinfection and a full sanitary survey should be implemented immediately. The sanitary survey should include a review of the integrity of the system. AND 2) Disinfection should be increased and/or an investigation undertaken to determine possible sources of contamination. These might include a breakdown in disinfection, a mains break, interruption to the supply, surges in supply, or deliberate or accidental contamination of the system. The investigation may include a visual inspection of the system and associated service reservoirs by trained personnel. When found, the source of contamination should be eliminated.

Table 10.10 *Guideline values for physical and chemical characteristics*

Characteristic	Guideline values*		Comments
	Health	Aesthetic[a]	
Acrylamide	0.0002		Minor impurity of polyacrylamide, used sometimes as a flocculant aid.
Aluminium (acid-soluble)	[c]	0.2	Guideline value based on post-flocculation problems; < 0.1 mg/L desirable. Lower levels needed for renal dialysis. No health-based guideline value can be established currently.
Ammonia (as NH_3)	[c]	0.5	Presence may indicate sewage contamination and/or microbial activity. High levels may corrode copper pipes and fittings.
Antimony	0.003		Exposure may rise with increasing use of antimony-tin solder.
Arsenic	0.007		From natural sources and mining/industrial/agricultural wastes.
Asbestos	[c]		From dissolution of minerals/industrial waste, deterioration of asbestos-cement pipes in distribution systems. No evidence of cancer when ingested (unlike inhaled asbestos).
Barium	0.7		Primarily from natural sources.
Benzene	0.001		Could occur in drinking water from atmospheric deposition (motor vehicle emissions) and chemical plant effluent. Human carcinogen.
Beryllium	[c]		From weathering of rocks, atmospheric deposition (burning of fossil fuels) discharges.
Boron	4		From natural leaching of minerals and contamination. < 1 mg/L in uncontaminated sources; higher levels may be associated with seawater intrusion.
Bromate	0.02		Possible byproduct of disinfection using ozone, otherwise unlikely to be found in drinking water.
Cadmium	0.002		Indicates industrial or agricultural contamination; from impurities in galvanised (zinc) fittings, solders and brasses.
Carbon tetrachloride	0.003		Sometimes occurs as impurity in chlorine used for disinfection (it is not a disinfection byproduct).

Table 10.10 *Guideline values for physical and chemical characteristics (Continued)*

Characteristic	Guideline values*		Comments
	Health	Aesthetic[a]	
Chloramine – see monochloramine			
Chlorate	[c]		Byproduct of chlorine dioxide disinfection.
Chloride	[e]	250	From natural mineral salts, effluent contamination. High concentrations more common in groundwater and certain catchments.
Chlorinated furanones (MX)	[c]		Byproduct of Chlorination.
Chlorine	5	0.6	Widely used to disinfect water, and this can produce (free) chlorinated organic byproducts. Odour threshold generally 0.6 mg/L, but 0.2 mg/L for a few people. In some supplies it may be necessary to exceed the aesthetic guideline in order to maintain an effective disinfectant residual throughout the system.
Chlorine dioxide	1	0.4	Oxidising agent and disinfectant in water treatment.
Chlorite	0.3		Byproduct of chlorine dioxide disinfection.
Chloroacetic acids			Byproduct of chlorination.
chloroacetic acid	0.15		
dichloroacetic acid	0.1		
trichloroacetic acid	0.1		
Chlorobenzene	0.3	0.01	Could occur in drinking water from spills or discharges. Taste/odour threshold (0.01 mg/L) is well below health level.
Chloroketones			Byproduct of chlorination.
1,1-dichloropropanone	[c]		
1,3-dichloropropanone	[c]		
1,1,1-trichloropropanone	[c]		
1,1,3-trichloropropanone	[c]		
Chlorophenols			Byproduct of chlorination of water containing phenol or related chemicals.
2-chlorophenol	0.3	0.0001	
2,4-dichlorophenol	0.2	0.0003	
2,4,6-trichlorophenol	0.02	0.002	
Chloropicrin	[c]		Byproduct of chlorination.
Chromium (as Cr(VI))	0.05		From industrial/agricultural contamination of raw water or corrosion of materials in distribution system/plumbing. If guideline value exceeded, analyse for hexavalent chromium.
Copper	2	1	From corrosion of pipes/fittings by salt, low pH water. Tast threshold 3mg/L. High concentrations colour water blue/green. >1mg/L may stain fittings. >2mg/l can cause ill effects in some poeple.
Cyanide	0.08		From industrial waste and some plants and bacteria.
Cyanogen chloride (as cyanide)	0.08		Byproduct of chloramination.
Dichlorobenzenes			
1,2-dichlorobenzene	1.5	0.001	Could occur in drinking water from spills, discharges, atmospheric deposition, leaching from contaminated soils. Health levels are well above offensive taste/odour thresholds.
1,3-dichlorobenzene	[c]	0.02	
1,4-dichlorobenzene	0.04	0.003	
Dichloroethanes			
1,1-dichloroethane	[c]		Could occur in drinking water from industrial effluents, spills, discharges.
1,2-dichloroethane	0.003		

Table 10.10 *Guideline values for physical and chemical characteristics (Continued)*

Characteristic	Guideline values*		Comments
	Health	Aesthetic	
Dichloroethenes			Rarely found in drinking water; found occasionally in groundwater from wells heavily contaminated by solvents.
1,1-dichloroethene	0.03		
1,2-dichloroethene	0.06		
Dichloromethane (methylene chloride)	0.004		Widely used solvent, commonly found in ground and surface waters overseas. Volatilises from surface waters and biodegrades in the atmosphere.
Dissolved oxygen	Not necessary	> 85%	Low concentrations allow growth of nuisance microorganisms (iron/manganese/sulfate/nitrate-reducing bacteria) causing taste and odour problems, staining, corrosion. Low oxygen concentrations are normal in groundwater supplies and the guideline value may not be achievable.
Epichlorohydrin	0.0005[d]		Used in manufacture of some resins used in water treatment.
Ethylbenzene	0.3	0.003	Natural component of petrol and petroleum products.
Ethylenediamine tetraacetic acid (EDTA)	0.25		Metal-complexing agent widely used in industry and agriculture, and as a drug in chelation therapy.
Fluoride	1.5		Occurs naturally in some water from fluoride-containing rocks. Often added at up to 1 mg/L to protect against dental caries. > 1.5 mg/L can cause dental fluorosis. > 4 mg/L can cause skeletal fluorosis.
Formaldehyde	0.5		Byproduct of ozonation.
Haloacetonitriles			Byproduct of chlorination.
dichloroacetonitrile	[c]		
trichloroacetonitrile	[c]		
dibromoacetonitrile	[c]		
bromochloroacetonitrile	[c]		
Hardness (as $CaCO_3$)	Not necessary	200	Caused by calcium and magnesium salts. Hard water is difficult to lather. < 60 mg/L $CaCO_3$ soft but possibly corrosive. 60-200 mg/L $CaCO_3$ good quality. 200-500 mg/L $CaCO_3$ increasing scaling problems. > 500 mg/L $CaCO_3$ severe scaling.
Hexachlorobutadiene	0.0007		Industrial solvent.
Hydrogen sulfide	[c]	0.05	Formed in water by sulfate-reducing microorganisms or hydrolysis of soluble sulfide under anoxic conditions. Obnoxious 'rotten egg' odour, threshold 0.05 mg/L.
Iodine	[c]		Can be used as an emergency water disinfectant. Taste threshold 0.15 mg/L.
Iodide	0.1		From mineral and salt deposits.
Iron	[c]	0.3	Occurs naturally in water, usually at < 1 mg/L, but up to 100 mg/L in oxygen-depleted groundwater. Taste threshold 0.3 mg/L. High concentrations stain laundry and fittings. Iron bacteria cause blockages, taste/odour, corrosion.
Lead	0.01		Occurs in water via dissolution from natural sources or household plumbing containing lead (e.g. pipes, solder).
Manganese	0.5	0.1	Occurs naturally in water; low in surface water, higher in oxygen-depleted water (e.g. groundwater at bottom of deep storages). > 0.1 mg/L causes taste, staining. < 0.05 mg/L desirable.
Mercury	0.001		From industrial emissions/spills. Very low concentrations occur naturally. Organic forms most toxic, but these are associated with biota, not water.

Table 10.10 *Guideline values for physical and chemical characteristics (Continued)*

Characteristic	Guideline values*		Comments
	Health	Aesthetic[a]	
Molybdenum	0.05		Concentrations usually < 0.01 mg/L; higher concentrations from mining, agriculture, or fly-ash deposits from coal-fuelled power stations.
Monochloramine	3	0.5	Used as water disinfectant. Odour threshold 0.5 mg/L.
Nickel	0.02		Concentrations usually very low; but up to 0.5 mg/L reported after prolonged contact of water with nickel-plated fittings.
Nitrate (as nitrate)	50		Occurs naturally. Increasing in some waters (particularly groundwater) from intensive farming and sewage effluent. Guideline value will protect bottle-fed infants under 3 months from methaemoglobinaemia. Adults and children over 3 months can safely drink water with up to 100 mg/L nitrate.
Nitrite (as nitrite)	3		Rapidly oxidised to nitrate (see above).
Nitrilotriacetic acid	0.2		Chelating agent in laundry detergents (replacing phosphate). May enter water through sewage contamination.
Organotins			
dialkyltins	[c]		
tributyltin oxide	0.001		Stabilisers in plastics, may leach from new poly vinyl chloride (PVC) pipes for a short time. Tributyltins are biocides used as antifouling agents on boats and in boiler waters.
Ozone			As ozone used for disinfection leaves no residual, no guideline value has been established.
pH	[c]	pH 6.5-8.5	While extreme pH values (< 4 and > 11) may adversely affect health, there are insufficient data to set a health guideline value. < 6.5 may be corrosive. > 8 progressively decreases efficiency of chlorination. > 8.5 may cause scale and taste problems. New concrete tanks and cement-mortar lined pipes can significantly increase pH and a value up to 9.2 may be tolerated provided monitoring indicates no deterioration in microbial quality.
Plasticisers			
di(2-ethylhexyl) phthalate	0.01		Used in all flexible PVC products, and may leach from these over a long time. Could also occur in drinking water from spills.
di(2-ethylhexyl) adipate	[c]		
Polycyclic aromatic hydrocarbons (PAHs)			
Benzo-(a)-pyrene	0.00001 (10 ng/L)		Widespread. Contamination can occur through atmospheric deposition, or leaching from bituminous linings in distribution systems.
Selenium	0.01		Generally very low concentrations in natural water.
Silver	0.1		Concentrations generally very low. Silver and silver salts occasionally used for disinfection.
Sodium	[e]	180	Natural component of water. Guideline value is taste threshold.
Styrene (vinylbenzene)	0.03	0.004	Could occur in drinking water from industrial contamination.
Sulfate	500	250	Natural component of water, and may be added via treatment chemicals. Guideline value is taste threshold. > 500 mg/L can have purgative effects.
Taste and odour	Not necessary	Acceptable to most people	May indicate undesirable contaminants, but usually indicate problems such as algal or biofilm growths.
Temperature	Not necessary	No value set	Generally impractical to control; rapid changes can bring complaints.

Table 10.10 *Guideline values for physical and chemical characteristics (Continued)*

Characteristic	Guideline values*		Comments
	Health	Aesthetic	
Tetrachloroethene	0.05		Dry-cleaning solvent and metal degreaser. Could occur in drinking water from contamination or spills.
Tin	[e]		Concentrations in water very low; one of the least toxic metals.
Toluene	0.8	0.025	Occurs naturally in petrol and natural gas, forest-fire emissions. Could occur in drinking water from atmospheric deposition, industrial contamination, leaching from protective coatings in storage tanks.
Total dissolved solids	Not necessary	500	< 500 mg/L is regarded as good quality drinking water based on taste. 500-1000 mg/L is acceptable based on taste. > 1000 mg/L may be associated with excessive scaling, corrosion, and unsatisfactory taste.
Trichloroacetaldehyde (chloral hydrate)	0.02		Byproduct of chlorination.
Trichlorobenzenes (total)	0.03	0.005	Industrial chemical.
1,1,1-Trichloroethane	[c]		Could occur in drinking water from contamination/spills.
Trichloroethylene	[c]		Industrial solvent, cleaning fluid, metal degreaser. Could occur in drinking water from direct contamination or via atmospheric contamination of rainwater.
Trihalomethanes (THMs) (Total)	0.25		Byproduct of chlorination and chloramination
True Colour	Not necessary	15 HU	15 HU just noticeable in a glass. Up to 25 HU is acceptable if turbidity is low. If colour is high at time of disinfection, then the water should be checked for disinfection byproducts such as THMs.
Turbidity	[c]	5 NTU	5 NTU just noticeable in a glass. >1 NTU may shield some microorganisms from disinfection. <1 NTU desirable for effective disinfection.
Uranium	0.02		Occurs naturally, or from release from mine tailings, combustion of coal and phosphate fertilizers.
Vinyl chloride	0.0003		From chemical spills. Used in making PVC pipes. Human carcinogen.
Xylene	0.6	0.02	Could occur in drinking water as a pollutant, or from solvent used for bonding plastic fittings.
Zinc	[c]	3	Usually from corrosion of galvanised pipes/fittings and brasses. Natural concentrations generally < 0.01 mg/L. Taste problems > 3 mg/L.

* All values mg/L unless otherwise stated

HU = Hazen units; NTU = nephelometric turbidity units; THMs = trihalomethanes.

a – Aesthetic values are not listed if the compound does not cause aesthetic problems, or if the value determined from health considerations is the same or lower.

b – If present at all in Australian drinking waters, concentrations of all organic compounds other than disinfection byproducts are likely to be very low relative to the guideline value.

c – Insufficient data to set a guideline value based on health considerations.

d – The guideline value is below the limit of determination. Improved analytical procedures are required for this compound.

e – No health-based guideline value is considered necessary.

Note: All values are as 'total' unless otherwise stated.

Note: Routine monitoring for these compounds is not required unless there is potential for contamination of water supplies (e.g. accidental spillage).

Note: The concentration of all chlorination byproducts can be minimised by removing naturally occurring organic matter from the source water, reducing the amount of chlorine added, or using an alternative disinfectant (which may produce other byproducts). Action to reduce trihalomethanes and other byproducts is encouraged, but must not compromise disinfection.

Table 10.11 *Guideline values for pesticides*

Pesticide	Guideline value[a] (mg/L)	Health value[b] (mg/L)
Acephate		0.01
Aldicarb	0.001	0.001
Aldrin[c] (and dieldrin)	0.00001	0.0003
Ametryn	0.005	0.05
Amitrole[c]	0.001	0.01
Asulam		0.05
Atrazine[c]	0.0001	0.04
Azinphos-methyl	0.002	0.003
Benomyl		0.1
Bentazone		0.03
Bioresmethrin		0.1
Bromacil	0.01	0.3
Bromophos-ethyl		0.01
Bromoxynil		0.03
Carbaryl	0.005	0.03
Carbendazim		0.1
Carbofuran	0.005	0.01
Carbophenothion		0.0005
Carboxin	0.002	0.3
Chlordane[c]	0.00001	0.001
Chlorfenvinphos		0.005
Chlorothalonil	0.0001	0.03
Chloroxuron		0.01
Chlorpyrifos[c]		0.01
Chlorsulfuron		0.1
Clopyralid[c]	1	1
2,4-D[c]	0.0001	0.03
DDT[c]	0.00006	0.02
Diazinon	0.001	0.003
Dicamba		0.1
Dichlobenil		0.01
Dichlorvos	0.001	0.001
Diclofop-methyl		0.005
Dicofol		0.003
Dieldrin[c] (see aldrin)	0.00001	0.0003
Difenzoquat		0.1
Dimethoate		0.05
Diphenamid	0.002	0.3
Diquat[c]	0.0005	0.005
Disulfoton	0.001	0.003

Pesticide	Guideline value[a] (mg/L)	Health value[b] (mg/L)
Diuron[c]		0.03
DPA (2,2-DPA)		0.5
EDB	0.001	0.001
Endosulfan[c]	0.00005	0.03
Endothal	0.01	0.1
EPTC	0.001	0.03
Ethion		0.003
Ethoprophos	0.001	0.001
Etridiazole	0.0001	0.1
Fenamiphos		0.0003
Fenarimol	0.001	0.03
Fenchlorphos		0.03
Fenitrothion		0.01
Fenoprop		0.01
Fensulfothion	0.01	0.01
Fenvalerate		0.05
Flamprop-methyl		0.003
Fluometuron		0.05
Formothion		0.05
Fosamine[c]		0.03
Glyphosate	0.01	1
Heptachlor[c] (including its epoxide)	0.00005	0.0003
Hexaflurate		0.03
Hexazinone[c]	0.002	0.3
Lindane[c]	0.00005	0.02
Maldison		0.05
Methidathion		0.03
Methiocarb	0.005	0.005
Methomyl	0.005	0.03
Methoxychlor	0.0002	0.3
Metolachlor	0.002	0.3
Metribuzin	0.001	0.05
Metsulfuron-methyl		0.03
Mevinphos	0.005	0.005
Molinate[c]	0.0005	0.005
Monocrotophos		0.001
Napropamide	0.001	1
Nitralin		0.5
Norflurazon	0.002	0.05

Table 10.11 *Guideline values for pesticides*

Pesticide	Guideline value[a] (mg/L)	Health value[b] (mg/L)
Oryzalin		0.3
Oxamyl	0.005	0.1
Paraquat[c]	0.001	0.03
Parathion		0.01
Parathion methyl	0.0003	0.1
Pebulate	0.0005	0.03
Pendimethalin		0.3
Pentachlorophenol	0.00001	0.01
Permethrin	0.001	0.1
Picloram[c]		0.3
Piperonyl butoxide		0.1
Pirimicarb		0.005
Pirimiphos-ethyl		0.0005
Pirimiphos-methyl		0.05
Profenofos		0.0003
Promecarb		0.03
Propachlor	0.001	0.05
Propanil	0.0001	0.5
Propargite		0.05
Propazine	0.0005	0.05
Propiconazole[c]	0.0001	0.1
Propyzamide	0.002	0.3
Pyrazophos		0.03
Quintozene		0.03
Simazine	0.0005	0.02
Sulprofos		0.01
Silvex (see Fenoprop)		
2,4,5-T	0.00005	0.1
Temephos[c]	0.3	0.3
Terbacil	0.01	0.03
Terbufos	0.0005	0.0005
Terbutryn	0.001	0.3
Tetrachlorvinphos	0.002	0.1
Thiobencarb		0.03
Thiometon		0.003
Thiophanate		0.005
Thiram		0.003
Triadimefon	0.1	0.002
Trichlorfon		0.005
Triclopyr[c]		0.01
Trifluralin	0.0001	0.05
Vernolate	0.0005	0.03

a – These are generally based on the analytical limit of determination (the level at which the pesticide can be reliably detected using practicable, readily available and validated analytical methods). If a pesticide is detected at or above this value the source should be identified and action taken to prevent further contamination.

b – Based on 10% of acceptable daily intake (ADI).

c – These pesticides have either been detected on occasions in Australian drinking water or their likely use would indicate that they may occasionally be detected.

Note: Routine monitoring for pesticides is not required unless potential exists for contamination of water supplies. See also Section 6.3.3

Table 10.12 *Guideline values for radiological quality of drinking water*

Guideline value
The total estimated dose per year from all radionuclides in drinking water, excluding the dose from potassium-40, should not exceed 1.0 mSv. If this guideline value is exceeded, the water provider, in conjunction with the relevant health authority, should evaluate possible remedial actions on a cost-benefit basis to assess what action can be justified to reduce the annual exposure.
Screening of water supplies
Compliance with the guideline for radiological quality of drinking water should be assessed, initially, by screening for gross alpha and gross beta activity concentrations. The recommended screening level for gross alpha activity is 0.5 Bq/L. The recommended screening level for gross beta activity is 0.5 Bq/L after subtraction of the contribution from potassium-40. If either of these activity concentrations is exceeded, specific radionuclides should be identified and their activity concentrations determined. The concentration of both radium-226 and radium-228 should always be determined, as these are the most significant naturally occurring radionuclides in Australian water supplies. Other radionuclides should be identified if necessary to ensure all gross alpha and beta activity is accounted for, after taking into account the counting and other analytical uncertainties involved in the determination.