



APPENDIX 014

## Water quality criteria



## 014 WATER QUALITY CRITERIA

Under the *Environment Protection Act 1993*, discharges from the desalination plant are to conform with the water quality criteria defined by the Environment Protection (Water Quality) Policy of 2003 (WQEPP). The criteria are based on the water quality guidelines produced by the Australian and New Zealand Environment and Conservation Council and the Agriculture and Resource Management Council of Australia and New Zealand (ANZECC/ARMCANZ 2000) but have trigger values specific to South Australia.

A key concept embodied within the WQEPP is the notion of environmental values, which for the marine environment include ecosystems; primary (immersion, e.g. swimming) and secondary (non-immersion, e.g. boating) contact and aesthetics; and aquaculture. For each combination of pollutant and environmental value, the WQEPP provides default ambient water quality objectives/criteria, generally in the form of thresholds that should not be exceeded, or if already exceeded (e.g. through natural causes), should not be further exceeded. For the purpose of the Draft EIS, the water quality criteria adopted have been the most stringent (i.e. the highest of the various thresholds associated with each environmental value).

The relevant pollutants (including metals, inorganics, organics and micro-organisms) and their corresponding water quality criteria are listed in Table O14.1. Clarification is being sought from the EPA as to whether the criteria apply at the immediate discharge point or at some point beyond, but near to, the return water diffuser ports (i.e. within a specified mixing zone). The concentrations of pollutants within the return water are based on the intake concentrations, conservatively assuming that the criteria would apply at the immediate discharge point, and that pollutants would be concentrated by a factor of two by the desalination process (see Table O14.1).

Recent measurements from near the proposed intake in Fitzgerald Bay and from near the Port Bonython Jetty have been included for most pollutants in Table O14.1. Many of the measured pollutants, however, were at levels not detectable by the NATA accredited procedures adopted by the laboratories used, and are therefore expressed as upper limits relating to the accuracy of the instruments. For some pollutants, further sampling is required to determine whether the criteria are likely to be met.

In the event that the water quality criteria cannot be met at the point of discharge, an application can be made to the Environment Protection Authority (EPA) requesting that the water quality criteria be met within a defined mixing zone.

The WQEPP does not specify criteria for salinity when discharging into marine waters.

Table O14.1 Comparison of desalination plant effluent quality with water quality criteria

Pollutant (mg/L unless otherwise specified)	Protected environmental value (criteria to be met in bold)			Concentration in intake water <sup>1</sup>	Concentration in discharge water	Conform to criteria?
	Aquatic ecosystem – marine	Recreation and aesthetics	Aquaculture			
<b>Metals</b>						
antimony (total)	<b>0.5</b>			<0.005	<0.01	Yes
arsenic (total)	0.05		<b>0.02</b>	0.0029	0.0058	Yes
beryllium (total)			<b>0.0001</b>	0.0002 (median <0.0001)	0.0004 (median <0.0002)	Uncertain <sup>2</sup>
cadmium (total)	<b>0.002</b>			<0.0002	<0.0004	Yes
chromium VI	<b>0.0044</b>			<0.002	<0.004	Yes
chromium (total)			<b>0.02</b>	0.0009	0.0018	Yes
copper (total)	<b>0.01</b>			0.011	0.022	Uncertain <sup>2</sup>
iron				0.0315	~ 5 mg/L <sup>3</sup>	No criteria
lead (total)	<b>0.005</b>		0.01	0.0018	0.0036	Yes
manganese (total)			<b>0.1</b>	0.0041	0.0082	Yes
mercury (total)	<b>0.0001</b>		0.0005	<0.0001	<0.0002	Uncertain <sup>2</sup>
nickel (total)	<b>0.015</b>		0.1	0.0023	0.0046	Yes
selenium (total)	<b>0.07</b>			<0.001	<0.002	Yes
silver (total)	<b>0.001</b>			<0.0001	<0.0002	Yes
thallium (total)	<b>0.02</b>			<0.005	<0.01	Yes
zinc (total)	0.05		<b>0.005</b>	0.02	0.04	Uncertain <sup>2</sup>
<b>Inorganics</b>						
ammonia (total as N)	<b>0.2</b>			<0.1	<0.2	Yes
ammonia (NH <sub>3</sub> as N)	<b>0.05</b>			<0.005	<0.01	Yes

Table O14.1 Comparison of desalination plant effluent quality with water quality criteria (cont'd)

Pollutant (mg/L unless otherwise specified)	Protected environmental value (criteria to be met in bold)			Concentration in intake water <sup>1</sup>	Concentration in discharge water	Conform to criteria?
	Aquatic ecosystem – marine	Recreation and aesthetics	Aquaculture			
BOD (5 day test)	10			5	No data <sup>4</sup>	Yes
chlorine (total)	0.0075			No data	No data <sup>4</sup>	Yes
colour	15			4	8	Yes
oxidized nitrogen (as N)	0.2			<0.01	<0.02	Yes
phosphorus (total as P)	0.5			0.02	0.04	Yes
phosphorus (soluble as P)	0.1			0.02	0.04	Yes
sulphide	0.002			0.182 (median 0.018)	0.364 (median 0.036)	Uncertain <sup>2</sup>
suspended sediment	10			32	No data <sup>4</sup>	Yes
total nitrogen (as N)	5			<1	<2	Yes
total organic carbon	10			4.5	9	Yes
turbidity (NTU)	10	20 (1° contact)		4	No data <sup>4</sup>	Yes
<b>Organics</b>						
2,4,5-trichlorophenol	0.008			<0.0001	<0.0002	Yes
oil and grease	10	10 (aesthetic)		5 (median 1.5)	10 (median 3)	Yes
pentachlorophenol	0.0002			<0.0001	<0.0002	Yes
Tributyltin	0.00002			No data	No data	Uncertain <sup>2</sup>
Benzene	0.3		0.04	<0.001	<0.002	Yes
Pesticides	not detectable			<0.0005	<0.001	Uncertain <sup>2</sup>
polyaromatic hydrocarbons (PAHs)	0.003			<0.001	<0.002	Yes
Phenol	0.05			<0.0005	<0.001	Yes
Polychlorinated biphenyls (PCBs)	0.000004		0.0005	<0.001	<0.002	Uncertain <sup>2</sup>
2,3,7,8-tetrachlorodibenzo- dioxin (TCDD)	not detectable			No data	No data	Uncertain <sup>2</sup>
<b>Micro-organisms</b>						
faecal coliforms (organisms/100 mL)		150-1000 (1 and 2° contact)	0	735 (median <2; maximum <i>E. coli</i> < 2)	1470 (median <4; maximum <i>E. coli</i> < 4)	Uncertain <sup>2</sup>
Enterococci (organisms/100 mL)		33 (1° contact)		2	4	Yes
<b>Other characteristics</b>						
oxygen (dissolved)	>6			6.3 (min)	5.5-7 <sup>5</sup>	Uncertain <sup>2</sup>
Salinity (percent variation)				<43 g/L	<78 g/L	No criteria

<sup>1</sup> Values are from grab sample results taken in vicinity proposed intake pipe from near the Port Bonython jetty. Unless otherwise specified, maximum values are provided. Laboratories used include The Australian Water Quality Centre at Bolivar, SA and ALS Laboratory Group in Sydney.

<sup>2</sup> Uncertainty due to the protected environmental value level being lower than the laboratory level of reporting threshold, or further sampling required.

<sup>3</sup> Ferric (insoluble) iron will be added as a coagulant. Although solids are largely removed from the backwash prior to discharge there may be some residual ferric iron discharged with the return water.

<sup>4</sup> Reduced/removed through desalination process.

<sup>5</sup> See Chapter 16, Marine Environment.

Review of Table O14.1 suggests that the desalination plant discharge would conform with applicable water quality criteria for most pollutants where data currently exists.

## O14.1 REFERENCES

Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, National Water Quality Management Strategy, Paper no. 4, ANZECC, Canberra, & ARMCANZ, Canberra.