



Conservation Council of South Australia Inc

Submission to the Environment Resources Development Committee On Desalination.

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The **Conservation Council of South Australia Inc (CCSA)** is the peak conservation body for South Australia, representing over 55 of the State's environment and conservation organisations.

CCSA is an independent non-profit, non party-political, community based organisation which provides resources, advice and representation for the SA environment movement, and which leads many of the key conservation campaigns in SA.

CCSA is known for its success in developing long term community development, education, and on-ground environmental restoration programs.

CCSA regularly liaises with Local, State and Federal Governments, Government agencies, media, educational institutions, NGOs, unions, industry, business and other groups on matters relating to the environment and social justice.

As a community organization, much of what CCSA achieves is through a large network of skilled volunteers from all walks of life – for its office, on-ground, governance and campaign activities.

CCSA is committed to a healthy environment for South Australia.

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Terms of Reference

1. the introduction of additional salts and chemicals into the marine environment;
2. the adequacy of tidal movements to disperse brine and chemicals;
3. the potential impact on a range of marine flora and fauna;
4. the potential impact on commercial and recreational fishing sectors;
5. the potential impact of contamination leachate from the location; and
6. any other matter

Executive Summary

The **Conservation Council of South Australia (CCSA)** is the peak environment and conservation body in South Australia. It represents over 50 member groups and has had a long standing interest in the health and wellbeing of the State's ecosystems and biodiversity.

This submission puts forward CCSA's position on desalination in general, and in relation to the specific proposals before the SA community at present, namely the Port Stanvac and Point Lowly proposals.

CCSA is not opposed to desalination *per se*, nonetheless we recommend that desalination should be an option of last resort. Analysis of the current proposals indicates that desalination fails to pass a reasonable cost-benefit analysis on the grounds of cost, energy intensity and greenhouse gas emissions alone, let alone consideration of its impacts on coast and marine environments and ecology.

In this regard, CCSA has identified specific concerns around each of the terms of reference including:

- the introduction of additional salts and chemicals into the marine environment
- the adequacy of tidal movements to disperse brine and chemicals
- the potential impact on a range of marine flora and fauna
- the potential impact on commercial and recreational fishing sectors

This submission discusses these issues and attempts to quantify the levels of risk, in a context where we acknowledge that if desalination is progressed, limited funding may preclude other more sustainable options.

CCSA does not support the desalination plants as they are currently proposed. Instead, CCSA recommends that the ERD Committee look to holistically address the long term sustainability of Adelaide's water supplies through alternative, lower cost and more environmentally friendly options, such as demand management, storm and rainwater harvesting, and wastewater recycling opportunities.

Introduction

This submission puts forward the Conservation Council of South Australia's (CCSA) position on desalination in general, and in relation to the specific proposals before the SA community at present, namely the Port Stanvac and Point Lowly proposals.

CCSA has identified specific concerns around each of the terms of reference, including the introduction of additional salts and chemicals into the marine environment; the adequacy of tidal movements to disperse brine and chemicals; the potential impact on a range of marine flora and fauna; and the potential impact on commercial and recreational fishing sectors.

This submission discusses these issues in more detail and attempts to quantify the levels of risk, in a context where we acknowledge that limited funding may preclude other more sustainable options, if desalination is progressed.

The introduction of additional salts and chemicals into the marine environment.

An article published in the *Australian Marine Science Association Bulletin*¹ states that any of the following could potentially be included in desalination brine:

- Chemicals from pre-treatment of the feedwater; these may include NaOCl (sodium hypochlorite) or free chlorine, used for chlorination to prevent biological growth (anti-fouling) on infrastructure
- FeCl₃ (iron chloride) or AlCl₃ (aluminium chloride) used for the flocculation and removal of suspended matter from the water, H₂SO₄ (sulphuric acid) or HCl (hydrochloric acid) used for pH adjustment to increase membrane efficiency
- Sodium hexa-meta-phosphate (NaPO₃)₆ or similar, to prevent scale formation on the pipes and on the membranes
- Sodium sulphite (NaHSO₃) used in order to neutralise any remains of chlorine in the feed water
- Chemicals used in flushing the pipelines and cleaning the membranes in reverse osmosis plants; these may include sodium compounds, hydrochloric acid, citric acid, alkalines, polyphosphate, biocides, copper sulfate, and acrolein
- Chemicals used to preserve the reverse osmosis membranes (e.g. propylene glycol, glycerine, or sodium bisulphite)
- Organics and metals that are contained in the feedwater and concentrated in the desalination process
- Metals that are picked up by the brine in contact with plant components and pipelines;

The brine may potentially have a salt concentration 1.3 to 1.7 times that of the original seawater (seawater salt concentration is about 35 parts per thousand (ppt); desalination plants discharge brine with 46 to 60 ppt).

Salt concentrations may be reduced by mixing desalination plant discharges with other discharges, such as treated wastewater. However, using treated wastewater as an alternative water source for agriculture, as is currently the case with water from the Bolivar wastewater treatment plant, is preferable.

¹ Winter, 175, 2007, pp. 22-24

The adequacy of tidal movements to disperse brine and chemicals

Questions surrounding the adequacy of tidal movements are discussed in some detail in the draft paper by Kaempf, *et al*². The modelling undertaken by Kaempf's team clearly shows that the upper reaches of either gulf are the most unsuitable places for placing desalination discharge outlets.

Although the Port Stanvac development is not proposing to discharge in the upper reaches of Gulf St Vincent, the modelling shows that there is still the potential for an increase in the concentration of the discharge (by 8%) and an increase in salinity (of 3 ppt) in the vicinity of the discharge area.

The potential impact on a range of marine flora and fauna

The potential impacts on marine flora and fauna are significant.

It is known that small amounts of copper can negatively affect the reproductive capabilities of marine phytoplankton³, the basis of marine food webs.

Whilst we cannot comment specifically on the actions of any of the chemicals listed above, it is clear that the potential build up of any chemicals to levels above background levels will have an impact on the marine environment.

Marine organisms are evolved to cope with a range of environmental variables, such as temperature, salinity and exposure to air/sunlight. However, changes in salinity levels outside of the average range within which organisms normally cope will be detrimental to their survival.

There is the potential for metals from the discharged brine to bio-accumulate up the food chain and harm top predators. This has been seen in many examples around the world but close to home, the Port Adelaide dolphins have a significant heavy metal loading⁴, which may be contributing to the high infant mortality rate amongst the population – the highest in any known dolphin population in the world.

Both proposed desalination plants will need to take in large quantities of seawater (in the case of the Point Lowly plant, up to 290 megalitres per day). This will contain significant quantities of plankton, much of which is the eggs and larvae of a wide variety of marine organisms. Plankton is the basis of all marine food webs and as such is a significant food source that goes largely unrecognised and unvalued. If there is a significant reduction in plankton biomass, it will have effects that will ripple throughout food webs within both gulfs, both in terms of a reduction of recruitment into populations (from reduced egg/larvae numbers) and a reduction of populations from a potential reduction in a vital food source.

² Kaempf, *et al* 2008), in review.

³ Brand *et al*, 1986

⁴ EPA, 2005

Port Stanvac

The intertidal zone at Port Stanvac was recently surveyed by Dutton and Benkendorff (2008), who found thirteen rare species of molluscs that were recorded for the first time on South Australian intertidal reefs. They also found that 'eight mollusc species were only recorded within the Port Stanvac fenced area'⁵. Three species of red algae (seaweed) recorded at the Port Stanvac area have not previously been recorded along the Fleurieu Peninsula in similar surveys. The report highlights the Port Stanvac area as a regional biodiversity hotspot and therefore, extra measures must ensure the protection of both the intertidal and marine areas.

The jetty at Port Stanvac provides ideal habitat for members of the *Syngnathidae* family (seahorses, pipehorses and seadragons). Due to diving prohibitions in this area the presence of these animals around the jetty cannot be confirmed, but is highly likely. Members of this group are Matters of National Environmental Significance, being listed marine species under the *Environment Protection and Biodiversity Conservation Act (1999)* and therefore, caution must be exercised with reference to any action that may cause them disturbance, or disturbance of their habitat.

Point Lowly

It is well known that the marine area immediately adjacent to Point Lowly is used by thousands of giant Australian cuttlefish (*Sepia apama*) each winter (May – August) for breeding and egg laying, forming densities up to 85 animals per 100 m². This phenomenon is unique in the world and is therefore a major tourism attraction for Whyalla during the winter months when tourism would otherwise be very low. Recreational divers travel from around the world to observe the cuttlefish displaying and breeding. The area is significant for this species in the Spencer Gulf, as there are relatively few other rocky areas where the females can attach their eggs – this is thought to be the main reason why the cuttlefish gather in this area.

Genetic and morphological studies with sampling taken from the southern Australian temperate zone, have shown five distinct sub-species populations of this species⁶. The scientists undertaking this research state that 'within South Australia, the breeding aggregation in the upper Spencer Gulf forms a separate population, with minimal interbreeding with the lower Spencer Gulf and Gulf St Vincent population'. This implies that the upper Spencer Gulf population is in essence trapped, due to ecological and other differences. Therefore, it is particularly vulnerable to changes in habitat and environmental parameters and requires separate management from other populations of this species.

Another vulnerable aspect of this species is that '*S. apama* only lives for one to two years before breeding and dying, reducing overlap and gene flow between generations'. The success of each generation is totally dependent on the previous generation. Therefore a sudden and 'dramatic decrease in the standing biomass of the breeding aggregation could be devastating for the upper Spencer Gulf population'.

⁵ Dutton & Benkendorff, 2008, p.13

⁶ Gillanders & Donellan, 2008

A Flinders University honours student recently conducted a series of experiments on embryonic *S. apama*⁷. The results showed that at a salinity of 45 practical salinity units (psu) the embryos showed a significant decrease in both length and weight and a couple were malformed. At salinities of 50 psu and above there was 100% mortality of embryos.

Other impacts in this region, including a very large new jetty for cape-size vessels, will compound the disturbance and impacts on this significant species.

The potential impact on commercial and recreational fishing sectors

Given the potential for detrimental impacts on marine organisms there would be concomitant flow-on effects for commercially and recreationally fished species. The impacts may vary depending on the trophic level of the species, i.e. its position in marine food webs. As previously mentioned, the large intake of eggs and larvae in plankton may substantially reduce populations, including species such as the Western King Prawn (*Melicertus latisulcatus*), a particularly valuable commercial species in the Spencer Gulf. This may have substantial economic impacts as well as ecological ones that may be unforeseen until it is too late.

Any Other Matters

The potential marine impacts aside, CCSA believes the relative merits of desalination should be assessed in an open and transparent manner, utilising a commonly understood methodology. This has recently been completed by Sustainable Focus with Richard Clarke & Associates⁸ utilising the following criteria:

- Reliability of service
- Affordability
- Current availability
- Human health
- Flood mitigation potential
- Upstream & in-stream environmental protection
- Downstream environmental protection
- Greenhouse emissions/ carbon intensity

This report highlighted that desalination is capable of providing a reliable source of climate-independent water, however it is a relatively expensive option. *Waterproofing Adelaide* estimates costs in the order of \$1.50-\$2.00/kL. This does not take into account either the capital costs for construction, or any rise in the cost of electricity due to a National Emissions Trading Scheme⁹.

⁷ Dupavillon, 2008

⁸ Sustainable Focus with Richard Clarke & Associates, (2008) Report on Sustainable Water Options for Adelaide, Adelaide.

⁹ Waterproofing Adelaide 2005, quoted in *ibid*, p26.

Whilst the Port Stanvac plant is not currently online, it could be operational in the short to medium term of a year or two. This is equivalent to some options and quicker than others, such as expanding storages in the Mt. Lofty ranges.

Both the proposed plants will be capable of providing potable water, although questions have been raised as to whether the Point Lowly site would need to treat all of its output to that standard, which would make that proportion of water cheaper in energy terms.

Unlike stormwater harvesting, desalination offers no flood mitigation benefits, nor does it reduce pollution to the gulf. Desalination has minimal benefits on the upstream environment, but with significant downstream impacts from the brine discharge and other associated chemicals.

Desalination is clearly a very energy intensive option. The Sustainable Focus report rates it as almost ten times the intensity of standard wastewater treatment and four times as intense as desalinating stormwater¹⁰. Whilst the State Government has said it will be carbon neutral there has been no commitment from either the Government or BHP-Billiton (the proponents of the Pt Lowly plant) to using 100% renewable energy to power it. This is especially significant, given the likelihood that the Port Stanvac desalination plant could become the sixth largest electricity consumer in the State, once the energy requirements to pump desalinated water back uphill into storages located at Happy Valley and elsewhere, are factored in. Clearly any desalination plant that is not powered by renewable energy will make a significant contribution to the state's carbon footprint and make achieving the SA State Strategic Plan (SASP) targets in relation to greenhouse gas emissions much harder to achieve.

The proposal clearly runs counter to the long term aim of creating a more sustainable environment, economy and society in SA.

Recent analysis has highlighted that potable water can be obtained from a variety of sources more cheaply and less energy-intensively than via desalination¹¹.

Finally, CCSA has concerns that if South Australia gets locked into a fast-tracked 'design, build, maintain and operate' contract with what is likely to be a foreign consortium, we may be obliged to purchase the desalinated water whether we need it or not.

Given all of these concerns, CCSA believes that we should not consider desalination until we have exhausted the range of preferable options for our water supplies. CCSA strongly recommends that desalination be the option of last resort.

¹⁰ Sustainable Focus, op cit, p26.

¹¹ *ibid*

Conclusion

CCSA considers that a desalination plant is not the solution to Adelaide's water 'crisis'. In fact it may exacerbate and worsen the situation by re-directing limited funds away from more sustainable and multi-functional options such as stormwater harvesting and aquifer storage and recharge.

CCSA has raised a number of significant ecological and environmental concerns with regard to these proposals. We would urge the ERD Committee to recommend that the desalination plants currently proposed are suspended pending a full EIS on the sites proposed. An essential component of these will be comprehensive baseline monitoring being conducted prior to any development taking place.

As things currently stand, numerous issues of scientific concern have been raised without adequate explanation.

On the whole, analysis of the proposals for desalination of seawater at Port Stanvac or Point Lowly fails to pass a reasonable cost-benefit analysis on the grounds of cost, energy intensity and greenhouse gas emissions alone, excluding the impacts on coast and marine environments and ecology¹². CCSA concludes that the desalination plants currently proposed therefore should be options of absolute last resort.

CCSA urges the ERD Committee to oppose the desalination plants as they are currently proposed and instead look to holistically address the long term sustainability of Adelaide's water supplies through alternative, lower cost and more environmentally friendly options, such as stormwater harvesting, demand management and recycling opportunities.

¹² Sustainable Focus, *op cit*, p26.

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