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Recommendations for AdelaideAqua License Application (Adelaide Desalination Plant)

Dear Madam or Sir

I wish to make the following comments and recommendations regarding the above license application.

General Aspects

Seawater desalination plants should not be operated in Australia as these do not comply with five criteria required for adaptation to climate change, outlined below, and given that there are sustainable and low-cost alternatives such as stormwater harvesting. Barnett and O'Neill (2009) define "maladaptation" as:

*Action taken ostensibly to avoid or reduce vulnerability to climate change that impacts adversely on, or increases the vulnerability of other systems, sectors or social groups*

Furthermore, Barnett and O'Neill (2009) use the Wonthaggi desalination project as an example of maladaptation to climate change on the basis of the following five criteria:

1. Increasing emissions of greenhouse gases (enhanced energy requirements)
2. Disproportional burdening the most vulnerable (increases in water & electricity costs, negative marine impacts, etc.)
3. High opportunity costs (there are cheaper alternatives)
4. Reduce incentive to adapt (continued high water usage)
5. Path dependency (commitment of capital and institutions, future changes difficult)

The maladaptation concept proposed by Barnett and O'Neill (2009) is designed as a general tool for use in decision-making. Some developments do not not meet one of these criteria, others more. Interestingly, the Wonthaggi desalination project and, equally, the other Australian desalination projects do meet **all** of these fundamental criteria.

Given the approval of the Port Stanvac desalination plant by the South Australian Government, which ignored the above criteria, other important environmental considerations come into play. The most important requirement is the adequate choice of location for the inlet and outlet of a seawater desalination plant (Lattemann and Höpner, 2008). Regions of exposed open-ocean flushing (if not an upwelling region) should be preferred over more

sheltered regions (such as estuaries). Marine regions of ecological significance should be avoided. The overwhelming consensus of scientists involved in the Adelaide Coastal Water Study is that pollutant inputs into Gulf St. Vincent should be substantially reduced in order to improve the health of the system (Fox et al., 2007). The existence of weak neap tidal flows (dodge tides) in South Australian gulfs are of particular concern supporting the built-up of point-source pollutants (Kämpf, 2008; 2009; Kämpf et al., 2009). Previous expert advice has widely been ignored. Clearly, South Australian gulfs do not qualify as a suitable candidate for desalination brine discharges and the decision to build a desalination plant at Port Stanvac in close vicinity to Adelaide's swimming beaches is a strategic mistake of enormous economical, ecological and social consequences.

The license application by the AdelaideAqua consortium is an important part of Adelaide's Desalination Project. On the basis of the above argumentation**, the license should not be granted** since the project violates many important principles of significance to sustaining Adelaide's marine and social environment.

Specific Requirements

If a license approval is unavoidable under the current political circumstances, I strongly recommend a strict and regular monitoring of key water quality parameters of both the desalination brine before it enters the sea and the seawater surrounding the discharge pipeline. According to approval conditions set by the South Australian Government (see EPA Annual Report 2008-2009), key conditions included requirements for an **Operational Environment Management and Monitoring Plan**, which has not been provided as part of the license application. The application should be dismissed until such a plan has been established. To demonstrate excellence, the operators should be obliged to draft a detailed Plan as part of their application.

Another key requirement set by the South Australian Government (see EPA Annual Report 2008-2009) is "**a 50 to 1 dilution of the brine discharge when it reaches the sea floor in all locations and under all tidal and sea condition**". This implies that operators must regularly measure and report a number of water quality parameters for calculation of dilution ratios. Firstly, this monitoring must be undertaken at least on a weekly basis in order to capture the tidal cycle with compulsory measurements during dodge tides. Secondly, calculations of dilution require knowledge of the salinity of the brine concentrate before it enters the water column together with measurements of salinity anomalies in the ambient water.

In addition to this, measurements of **dissolved oxygen levels** readily give indications of marine impacts and spatial scales of the brine plume. Hence, dissolved oxygen measurements should be compulsory as well together with specification of critical dissolved oxygen levels in the license. These measurements must cover the nearfield (within 100 m from the discharge pipeline) and, in case of any indication of critical salinity/oxygen levels, far beyond this (impacts can spread over several kilometres). The use of state-of-the-art accurate marine instruments is a standard requirement, but I recommend establishment of an independent scientific panel for quality control of the data.

It is alarming to find reference to “safe dilution values” of around 20 to 1 in the license application. Such alarmingly low dilutions, being in conflict with key requirements, should not be permitted under any circumstances. These values remind the author of the softening of license conditions for the Perth desalination plant. Following the observed bad performance of the discharge design, safe dilution requirements were reduced from the initial target value of 45 to 1 to an adjusted value of 20 to 1, implying enhanced stress on the marine environment. To avoid this, the safe dilution value in this license needs to be fixed at an **absolute and unchangeable value of 50 to 1**.

Discharge of untreated **backwash** can cause widespread damage to the marine environment and should strictly be prohibited in Australia. The applicants should be asked to provide detailed information on the treatment and discharge of backwash, which has been excluded from the application text despite its high significance. Certainly, chemical analyses of the backwash are an important requirement in conjunction with reporting of times and quantities of discharges into the sea. My understanding is that the backwash treatment will be done by external agencies. However, backwash is a product of the desalination process and therefore must be addressed in the license. This is to avoid the situation that the bashwash is later re-added to the same brine discharge operated by AquaAdelaide without any binding regulations.

Transparency of the monitoring efforts implies that data be made instantly available to the EPA for public release on their Website. Publication of dissolved oxygen levels and dilution ratios should be a minimum requirement. In addition to the above, independent scientists (like myself) should be given unlimited access to undertake own measurements in vicinity of the discharge location.

Another important point is that any monitoring task required detailed knowledge of the baseline ecologic conditions **prior** to the discharge. I am uncertain whether this baseline information exists or whether additional scientific studies are required. An independent expert scientific panel needs to be established to address this important point and to avoid future uncertainties and unnecessary debates of damages done.

Summary of specific requirements:

1. License applicants to produce a draft **Operational Environment Management and Monitoring Plan** as part of the application
2. **Free site access** for scientists for independent measurements
3. **Public release** of monitoring data
4. Specify safe dilution value of 50 to 1 & **dissolved oxygen threshold** in licence
5. License applicants to provide detailed information of **backwash treatment**
6. Include specific conditions for backwash treatment/discharge in the license
7. Establish **independent scientific expert panel** to oversee monitoring program

I am happy to provide further expert advice, if required.

Yours sincerely,

Assoc. Prof. Jochen Kaempf

**References:**

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