

**Review of plankton monitoring licence conditions for the Adelaide
Desalination Plant:
June 2014**

**Prepared for
AdelaideAqua Pty Ltd
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EXECUTIVE SUMMARY

Purpose

This document represents a report on the extent to which monitoring of planktonic systems from selected sites in the vicinity of Port Stanvac meets with the EPA Licence Conditions for the construction and operation of the Adelaide Desalination Plant (ADP) over the period February 2009 to 12-Dec-2013. The monitoring reports were associated with the construction (including commissioning) of the desalination plant (by AdelaideAqua D&C Consortium – AAD&C) from February 2009 to 12-Dec-2012 and to the operation of the desalination plant (AdelaideAqua Pty Ltd) from 12-Dec-2012 to 12-Dec-2013.

Background

AdelaideAqua Pty Ltd is the operator of the Adelaide Desalination Plant at Port Stanvac South Australia. Operation of the ADP requires the discharge of reject water to the marine environment; this activity was originally conducted under a licence issued to AAD&C by the Environment Protection Authority of South Australia (EPA Licence Number 26902) and subsequently under another licence issued to AAPL (EPA Licence Number 39143). These licences authorised AAD&C and AAPL to undertake a series of activities of environmental significance under Schedule 1 Part A of the Environment Protection Act 1993 (the Act). The licences had specific requirements in relation to “Discharges to Marine Waters” that are the subject of this report.

Section 14 (305-626) of the licence requires that the licensee must ensure that:

1. An independent review of all marine monitoring is conducted by independent specialist(s) as approved in writing by the EPA prior to the review commencing;
2. All marine monitoring from the period commencing with the issue of the licence and ending 12 months after project handover of the 100 GL desalination plant is included in the review; and
3. The full results of the review are provided to the EPA not more than 18 months after project handover of the 100 GL desalination plant.

The EPA has also advised that prior to appointment, the independent reviewer must be able to demonstrate to the EPA that:

1. They will use their own professional judgment;
2. They will take appropriate specialised advice when the issue is outside their expertise;
3. Their opinions will be reached independently;
4. In forming opinions, they will not be unduly influenced by the views or actions of others who may have an interest in the outcome of the review; and
5. They must declare any real or apparent conflict of interest.

With the approval of the EPA, Anthony Cheshire (the author of this report) was selected by AdelaideAqua Pty Ltd (AAPL) to undertake this review.

Approach

This review of plankton monitoring encompassed a study of all documentation provided by AdelaideAqua Pty Ltd which comprised a series of 12 monitoring reports each of which was produced by staff at AAD&C, AAPL or by experts contracted by the parties for that purpose.

Each report has been critically reviewed and key issues that pertain to compliance with the licence conditions have been aggregated into a summary that has been presented in this report.

Specific requirements

To consider the work done against the Scheduled Marine Monitoring Requirements detailed in Attachment A to Licences 26902 and 39143. These being:

16-Nov-2010 & 5-Dec-2012 – Collect seawater samples from the intake on 9 days evenly spaced across a 12 month period beginning with project handover of the 50 GL desalination plant. Samples to be sieved and phytoplankton species composition to be determined. Sampling to continue for a longer period if there are high content of species of concern. Sub-sample the intake stream of seawater to assess the number of larvae, spores and other plankton being entrained, and compare these numbers and taxonomic compositions to the plankton sampling done to that time. Final details of the monitoring plan to be provided prior to commencement.

As of 5 June 2013 - Sample the intake stream of seawater to assess the number of larvae, spores and other plankton being entrained, and compare these numbers and taxonomic compositions to the plankton sampling done to that time. Final details of monitoring plan to be approved prior to commencement.

General requirements

In addition the EPA require that the Independent Reviewer is to undertake a technical review of all marine monitoring results from the commencement date of the Licence 26902 (D&C) until 12 December 2013 (12 months after plant handover) in order to assess the environmental impact of the desalination plant. This matter will be addressed in a subsequent report.

Conclusion

The plankton monitoring program that was implemented is largely consistent with the requirements of the licence conditions (including amendments).

Over the period 16-Nov-2010 to 5-Jun-2012 3 stations were sampled including station ORP4 (outlet diffuser number 4), IRP (a station adjacent to the intake pipe – effectively equivalent to sampling of the intake pipe) and PP (a point midway between IRP and ORP4). Samples were collected over a period of two years, typically monthly but with a number of months that were missed (as opposed to 9 evenly spaced per year which would require sampling every 6 weeks). Timing differences of this sort would have no practical impact on the results and can be ignored.

Subsequently for the period June 2013 to April 2014 the program focussed on sampling the intake stream to determine the number of larvae, spores and other plankton being entrained. Samples were collected consistent with this requirement in June, August, October, November and December 2013 and also from January through to April 2014.

LICENCE CONDITION: PLANKTON MONITORING

In the following the specific requirements pertaining to the licence condition (plankton) are summarised along with information about the documents that have been reviewed.

Documents reviewed for this licence condition:

| Document Name | Reference |
|---|--|
| plankton_prelim_sep09.pdf | van Ruth, P., (2009). ADP plankton characterisation study - preliminary report September 2009. South Australian Research and Development Institute (Aquatic Sciences). |
| plankton_final_aug10.pdf | van Ruth, P., (2010). Adelaide Desalination Plant Plankton Characterisation Study, prepared for Adelaide Aqua. South Australian Research and Development Institute (Aquatic Sciences). |
| plankton_mar12.pdf | van Ruth, P., (2012). Adelaide Desalination Project Plankton Characterisation Study - Phase 2. South Australian Research and Development Institute (Aquatic Sciences). |
| ADP plankton monitoring program_June 2013.pdf | van Ruth, P., (2013). Adelaide Desalination Plant Plankton Monitoring Program June 2013 report. South Australian Research and Development Institute (Aquatic Sciences). |
| ADP plankton monitoring program_Aug 2013.pdf | van Ruth, P., (2013). Adelaide Desalination Plant Plankton Monitoring Program August 2013 report. South Australian Research and Development Institute (Aquatic Sciences). |
| ADP plankton monitoring program_Oct 2013.pdf | van Ruth, P., (2013). Adelaide Desalination Plant Plankton Monitoring Program October 2013 report. South Australian Research and Development Institute (Aquatic Sciences). |
| ADP plankton monitoring program_Nov 2013.pdf | van Ruth, P., (2013). Adelaide Desalination Plant Plankton Monitoring Program November 2013 Report. South Australian Research and Development Institute (Aquatic Sciences). |
| ADP plankton monitoring program_Dec 2013.pdf | van Ruth, P., (2013). Adelaide Desalination Plant Plankton Monitoring Program December 2013 Report. South Australian Research and Development Institute (Aquatic Sciences). |
| ADP plankton monitoring program_Jan 2014.pdf | van Ruth, P., (2014). Adelaide Desalination Plant Plankton Monitoring Program January 2014 Report. South Australian Research and Development Institute (Aquatic Sciences). |
| ADP plankton monitoring program_Feb 2014.pdf | van Ruth, P., (2014). Adelaide Desalination Plant Plankton Monitoring Program February 2014 Report. South Australian Research and Development Institute (Aquatic Sciences). |
| ADP plankton monitoring program_Mar 2014.pdf | van Ruth, P., (2014). Adelaide Desalination Plant Plankton Monitoring Program March 2014 Report. South Australian Research and Development Institute (Aquatic Sciences). |
| ADP plankton monitoring program_Apr 2014.pdf | van Ruth, P., (2014). Adelaide Desalination Plant Plankton Monitoring Program April 2014 Report. South Australian Research and Development Institute (Aquatic Sciences). |

Specific requirement (see Attachment A – Marine Monitoring Schedule):

16-Nov-2010 & 5-Dec-2012 – Collect seawater samples from the intake on 9 days evenly spaced across a 12 month period beginning with project handover of the 50 GL desalination plant. Samples were sieved and phytoplankton species composition determined. Sampling was to continue for a longer period if there was a high content of species of concern. Sub-sample the intake stream of seawater to assess the number of larvae, spores and other plankton being entrained, and compare these numbers and taxonomic compositions to the plankton sampling done to that time. Final details of the monitoring plan were to be provided prior to commencement.

As of 5 June 2013 - Sample the intake stream of seawater to assess the number of larvae, spores and other plankton being entrained, and compare these numbers and taxonomic compositions to the plankton sampling done to that time. Final details of the monitoring plan were to be approved prior to commencement.

Overall summary in relation to plankton monitoring

The plankton monitoring program was used to quantitatively assess the species composition and taxonomic makeup of phytoplankton, zooplankton and ichthyoplankton communities.

The design of the plankton monitoring program changed over time; initially (16-Nov-2010 & 5-Dec-2012) the requirement was for the collection of seawater samples from the intake on 9 days, evenly spaced across a 12 month period, beginning with project handover of the 50 GL desalination plant. Samples were to be sieved and phytoplankton species composition to be determined. Sampling was to continue for a longer period if there were higher numbers of species of concern¹.

In practice the initial phase of the sampling program sampled 3 stations including ORP4 (outlet diffuser number 4), IRP (a station adjacent to the intake pipe – effectively equivalent to sampling of the intake pipe) and PP (a point midway between IRP and ORP4). Samples were collected over a period of two years but these were typically monthly samples with a number of missed months (as opposed to 9 evenly spaced per year which would require sampling every 6 weeks). Timing differences of this sort would have no practical impact on the results and can be ignored.

Consistent with the specific requirements samples were collected and assessed using a range of different methods which allowed enumeration of the key plankton species. These methods identified a range of parameters that can be used to describe the structure and

¹ No definition was given that would define 'species of concern' but presumably these were intended to comprises potentially toxic or harmful species (e.g. selected species of cyanobacteria or dinoflagellates). Similarly it may also refer to species of ichthyoplankton that were either representative of commercial or protected species (e.g. eggs and larvae of species such as King George Whiting or the various sygnathid species).

function of the plankton communities all of which have been measured using standard methods including the use of HPLC for pigment analysis. These methods allowed the creation of an inventory of phytoplankton, zooplankton and ichthyoplankton community structure (although it was recognised that many ichthyoplankton samples, both eggs and larvae, cannot be identified). The methods also provided quantitative estimates of plankton productivity (both primary and secondary).

As of 5 June 2013 the specific requirements specified in the licence were to sample the intake stream of seawater to assess the number of larvae, spores and other plankton being entrained, and to compare these numbers and taxonomic compositions to the plankton sampling done to that time. Final details of the monitoring plan were to be approved prior to commencement.

Direct sampling of the intake tunnel was undertaken in June, August, October, November and December 2013 and also from January through to April 2014. The reports from these surveys outlined both a methodology for sampling and analysis of the data along with a summary of the data obtained from the intake tunnel samples. Whilst the results are quantitative, no direct comparison can be made to the previous data as there were differences in the type of samples collected (particularly in the context of the ichthyoplankton) where earlier data was collected from sampling an open water system. No guidance is given in the licence about how these results should be analysed or interpreted.

Appendix A KEY DATES IN PLANT CONSTRUCTION AND OPERATION

The following provides a list of key dates in the construction and operation of the plant. This material provides background to the review and in particular places the analysis and interpretation of each of the monitoring reports into context with the activities that were occurring on-site in the period leading up to the monitoring event.

| Date | Activity |
|-------------|--|
| 01-Feb-2009 | Construction activities commenced |
| 16-Nov-2009 | Maritime platform arrived on site |
| 08-Jul-2010 | Maritime platform completed operations |
| 01-Jun-2011 | First discharge and first intake of seawater |
| 14-Oct-2011 | First Water – plant production was (30 MLD) |
| 21-Mar-2012 | SP1 – Full production from first half the plant (150 MLD) |
| 31-May-2012 | SP2 – Full production from second half of the plant (150 MLD) |
| 24-Oct-2012 | Performance test – plant running at full production for 7 days (150 MLD) |
| 07-Nov-2012 | Performance test – plant running at full production for 7 days (150 MLD) |
| 21-Nov-2012 | Reliability test – continuous running at various production rates |
| 12-Dec-2012 | Plant handover from commissioning |
| | |