

**Review of salinity 200m monitoring licence conditions for the
Adelaide Desalination Plant:
June 2014**

**Prepared for
AdelaideAqua Pty Ltd
Report number 17 in the series**

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18-Jun-2014



Document control

| | |
|----------------|---|
| Title | Review of salinity 200m monitoring licence conditions for the Adelaide Desalination Plant |
| Revision | 5 |
| Author | Anthony Cheshire |
| Client | AdelaideAqua Pty Ltd |
| Date finalised | 18-Jun-2014 |
| Distribution | Vanesa Ayala |
| Version | Final version for publication |

For citation purposes this document should be referred to as:

CHESHIRE, A.C. (2014). REVIEW OF SALINITY 200M MONITORING LICENCE CONDITIONS FOR THE ADELAIDE DESALINATION PLANT, JUNE 2014. REPORT 17 IN A SERIES PREPARED FOR ADELAIDEAQUA PTY LTD BY SCIENCE TO MANAGE UNCERTAINTY PP: 9.

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EXECUTIVE SUMMARY

Purpose

This document represents a report on the extent to which monitoring of Salinity 200 m from the ADP diffuser 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 salinity 200m monitoring encompassed a study of all documentation provided by AdelaideAqua Pty Ltd which comprised a series of 11 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:

Licence 26902: Covering the period 1-Dec-2010 to 03-Dec-2012; Measure conductivity and temperature of seawater at locations MP5, MP6, MP7 and MP8 every 10 minutes.

Locations MP5 to MP8 comprise monitoring locations positioned 1 m above the seabed at four locations 200 m to the North, South, East and West of the ADP outfall.

The requirement to collect data under this licence condition was removed in April 2012.

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

There was a notable paucity of data collected under licence condition 17 although it should be noted that the requirement to collect these data was removed in April 2012. Prior to April 2012 plant operation was very intermittent (Appendix A) with the plant not reaching First Water from SP1 until 21-Mar-2012 and from SP2 on 31-May-2012. In effect the data collected was obtained before the plant moved to a level where operations were substantial and ongoing. As specified in the licence conditions the data have been recorded from four locations identified as MP5, MP6, MP7 and MP8.

Data collection was expected to cover the period from 01-Jul-2011 through to April 2012. Throughout this period the overall data coverage was poor (31%; Table 1) with no data collected in June 2011 and less than 60% data coverage in any other month.

While the licence condition required that data was recorded as conductivity and temperature the values were actually recorded as salinity (mg/L or ppt).

LICENCE CONDITION: SALINITY 200M MONITORING

In the following the specific requirements pertaining to the licence condition (salinity 200m) are summarised along with information about the documents that have been reviewed.

Documents reviewed for this licence condition:

| Document Name | Reference |
|------------------------|--|
| salinity_2011_jun.xls | AdelaideAqua, (2011). Salinity data for 100 m and 200 m stations (MP1-MP8) for June 2011. AdelaideAqua Pty Ltd. |
| salinity_2011_jul.xls | AdelaideAqua, (2011). Salinity data for 100 m and 200 m stations (MP1-MP8) for July 2011. AdelaideAqua Pty Ltd. |
| salinity_2011_aug.xls | AdelaideAqua, (2011). Salinity data for 100 m and 200 m stations (MP1-MP8) for August 2011. AdelaideAqua Pty Ltd. |
| salinity_2011_sept.xls | AdelaideAqua, (2011). Salinity data for 100 m and 200 m stations (MP1-MP8) for September 2011. AdelaideAqua Pty Ltd. |
| salinity_2011_oct.xls | AdelaideAqua, (2011). Salinity data for 100 m and 200 m stations (MP1-MP8) for October 2011. AdelaideAqua Pty Ltd. |
| salinity_2011_nov.xls | AdelaideAqua, (2011). Salinity data for 100 m and 200 m stations (MP1-MP8) for November 2011. AdelaideAqua Pty Ltd. |
| salinity_2011_dec.xls | AdelaideAqua, (2011). Salinity data for 100 m and 200 m stations (MP1-MP8) for December 2011. AdelaideAqua Pty Ltd. |
| salinity_2012_jan.xls | AdelaideAqua, (2012). Salinity data for 100 m and 200 m stations (MP1-MP8) for January 2012. AdelaideAqua Pty Ltd. |
| salinity_2012_feb.xls | AdelaideAqua, (2012). Salinity data for 100 m and 200 m stations (MP1-MP8) for February 2012. AdelaideAqua Pty Ltd. |
| salinity_2012_mar.xls | AdelaideAqua, (2012). Salinity data for 100 m and 200 m stations (MP1-MP8) for March 2012. AdelaideAqua Pty Ltd. |
| salinity_2012_apr.xls | AdelaideAqua, (2012). Salinity data for 100 m and 200 m stations (MP1-MP8) for April 2012. AdelaideAqua Pty Ltd. |

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

Licence 26902: Covering the period 1-Dec-2010 to 03-Dec-2012; Measure conductivity and temperature of seawater at locations MP5, MP6, MP7 and MP8 every 10 minutes.

Locations MP5 to MP8 comprise monitoring locations positioned 1 m above the seabed at four locations 200 m to the North, South, East and West of the ADP outfall.

The requirement to collect data under this licence condition was removed in April 2012.

Overall summary in relation to salinity 100m monitoring

Monitoring of conductivity and temperature in the sea at a series of locations around the diffuser was intended to provide data on the effect of discharge on salinity in the receiving environment as a basis for evaluating the performance of the diffuser.

Data have been collected from four locations (MP5-MP8) over the period 1-Jun-2011 to 30-Apr-2012 (Table 1). This covered the period of early operational testing (noting that the first intake and discharge of seawater occurred on 1-Jun-2011; Appendix 1) through to the first Full Production run on the first half of the plant (SP1; 21-Mar-2012).

Four CTDs (Conductivity, Temperature, Depth Sensors) were moored at a series of locations 200 m to the North, South, East and West (MP5-MP8) of the discharge line and these CTDs provided observations of conductivity and temperature at 10 minute intervals.

While the licence condition required that data was recorded as conductivity and temperature in fact, over the entire period that data were collected, values were recorded as salinity. Note however that a CTD records conductivity and temperature and then converts these values to salinity so it is assumed that the data were originally measured as required under the licence but stored in the form of salinity values.

It is relevant that for the period that this licence condition applied the plant only operated (i.e. discharged water) on an *ad-hoc* basis as required for operational testing (Appendix A). No attempt has been made to interpret the data other than to report the coverage of salinity values (noting that data were provided for review in a series of EXCEL files as detailed above).

Overall data coverage (31.2%) was deficient¹ throughout the entire period from June 2011 to the end of April 2012 (Table 1); with the consent of the EPA the requirement to collect data under this licence condition was discontinued in April 2012. It is apparent that the decision to discontinue collection of the 200 m salinity data reflects the fact that a similar series of data were collected at a distance of 100 m from the diffuser (Licence Condition 16). The 100 m data show that the diffuser is working in a manner that met the operational requirements and on this basis the 200 m data were somewhat redundant. On this basis, the lack of full accord of the data collected with the licence condition (17) would be very unlikely to have had a material impact on either the capacity to assess the performance of the diffuser or to have compromised the ability to detect an environmental impact on water quality (particularly given the other supporting data from Licence Conditions 6, 15 and 16).

¹ Qualitative evaluation of the data coverage has been based on the following scale; Excellent \geq 90%, Good \geq 75%, Fair \geq 60%, Deficient $<$ 60%. This scale presumes that there is an expectation of missed measurements due to sensor recalibration and maintenance, biofouling or other logistic issues but that coverage should not be heavily impacted by such issues.

Table 1 – Condition 16 - Monitoring of Conductivity and Temperature from locations MP1, MP2, MP3 and MP4.

| Year-Month | File | Start Date | End Date | Expected records | MP1 | MP2 | MP3 | MP4 | % by month |
|-------------------------------|-------------------|-------------------|-------------------|------------------|------------|------------|------------|------------|------------|
| 2011-06 | salinity_2011_jun | 01/06/2011 | 30/06/2011 | 4,320 | 0% | 0% | 0% | 0% | 0% |
| 2011_07 | salinity_2011_jul | 01/07/2011 | 31/07/2011 | 4,464 | 0% | 2% | 74% | 74% | 37% |
| 2011_08 | salinity_2011_aug | 01/08/2011 | 31/08/2011 | 4,464 | 0% | 0% | 100% | 0% | 25% |
| 2011_09 | salinity_2011_sep | 01/09/2011 | 30/09/2011 | 4,320 | 28% | 47% | 0% | 47% | 31% |
| 2011_10 | salinity_2011_oct | 01/10/2011 | 31/10/2011 | 4,464 | 59% | 84% | 0% | 73% | 54% |
| 2011_11 | salinity_2011_nov | 01/11/2011 | 30/11/2011 | 4,320 | 61% | 51% | 0% | 5% | 29% |
| 2011_12 | salinity_2011_dec | 01/12/2011 | 31/12/2011 | 4,464 | 41% | 41% | 0% | 41% | 31% |
| 2012_01 | salinity_2012_jan | 01/01/2012 | 31/01/2012 | 4,464 | 60% | 35% | 62% | 38% | 49% |
| 2012_02 | salinity_2012_feb | 01/02/2012 | 29/02/2012 | 4,176 | 0% | 0% | 97% | 74% | 43% |
| 2012_03 | salinity_2012_mar | 01/03/2012 | 31/03/2012 | 4,464 | 4% | 0% | 94% | 93% | 48% |
| 2012_04 | salinity_2012_apr | 01/04/2012 | 30/04/2012 | 4,320 | 1% | 8% | 20% | 20% | 12% |
| Compliance performance | | 01/01/2012 | 30/04/2012 | 48,240 | 23% | 24% | 38% | 40% | 31% |

Notes to Table 1:

- 1 In all cases only salinity values were provided – presumed to have been obtained from measurement of temperature and salinity.
- 2 Expected record number represents the number of 10 minute intervals in the respective months.
- 3 Percentage values represent the number of valid observations for each month as a percentage of the “Expected” number of records.

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 |
| | |