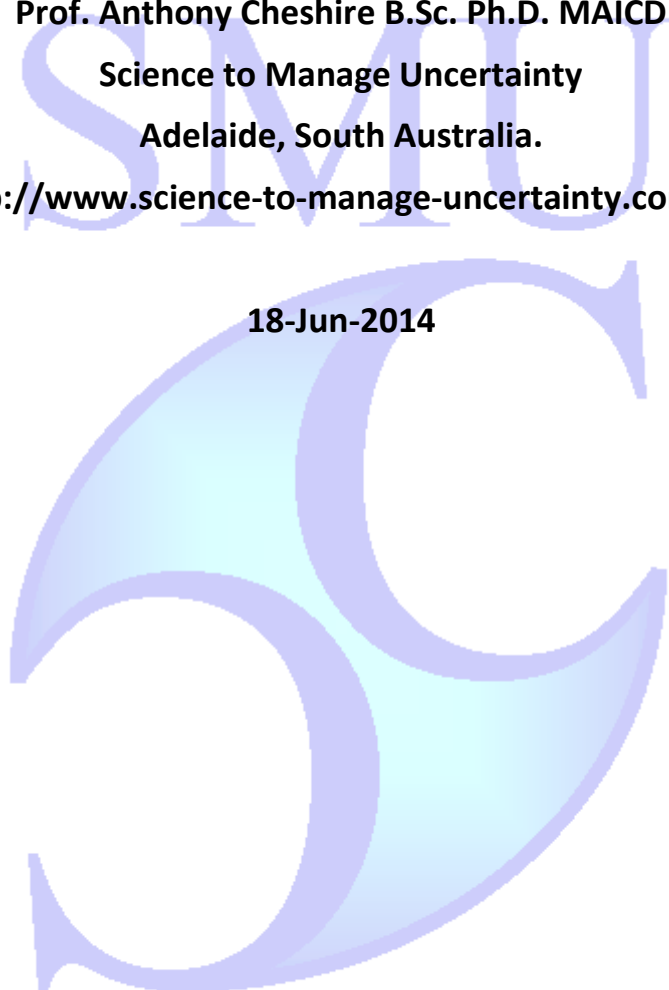


**Review of salinity 100m monitoring licence conditions for the
Adelaide Desalination Plant:
June 2014**

**Prepared for
AdelaideAqua Pty Ltd
Report number 16 in the series**

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EXECUTIVE SUMMARY

Purpose

This document represents a report on the extent to which monitoring of Salinity 100 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 100m monitoring encompassed a study of all documentation provided by AdelaideAqua Pty Ltd which comprised a series of 22 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 & 39143: Covering the period 1-Dec-2010 to 31-Dec-2013; Measure conductivity and temperature of seawater at locations MP1, MP2, MP3 and MP4 every 10 minutes.

Locations MP1 to MP4 comprise monitoring locations positioned 1 m above the seabed at four locations 100 m to the North, South, East and West of the ADP outfall.

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

Data have been collected since 01-Jun-2011 and data collection has continued to the end of 2013. Overall data coverage has been good (85.5%) with only one month (September 2012) when no data were collected.

As specified in the licence conditions the data have been recorded from four locations identified as MP1, MP2, MP3 and MP4.

Data coverage was somewhat patchy during the period of plant commissioning (between June 2011 and December 2012). Over this initial period data were not recorded as conductivity and temperature but rather as salinity (note however that a CTD records conductivity and temperature and then converts these values to salinity). Subsequently (since Dec 2012) the data have been recorded as separate conductivity and temperature measurements.

It needs to be noted that up until handover (12-Dec-2012; Appendix A) the plant only operated on an ad-hoc basis as required for operational testing. Subsequent to the commissioning of the plant (12-Dec-2012) the data coverage has been excellent (100% coverage) and has included reporting of both conductivity and temperature from each location at 10 minute intervals.

LICENCE CONDITION: SALINITY 100M MONITORING

In the following the specific requirements pertaining to the licence condition (salinity 100m) 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.
2012_5_Salinity_EPA_MM_MAY CONDITION 16_17.XLSX	AdelaideAqua, (2012). Salinity data for 100 m and 200 m stations (MP1-MP8) for May 2012. AdelaideAqua Pty Ltd.
2012_6_Salinity_EPA_MM_JUNE12_CON DITION 16_17.XLSX	AdelaideAqua, (2012). Salinity data for 100 m and 200 m stations (MP1-MP8) for June 2012. AdelaideAqua Pty Ltd.
2012_7_EPA_MM_JULY12_CONDITION 16_17.XLSX	AdelaideAqua, (2012). Salinity data for 100 m and 200 m stations (MP1-MP8) for July 2012. AdelaideAqua Pty Ltd.
2012_8_EPA_MM_AUGUST12_CONDITIO N 16_17.XLSX	AdelaideAqua, (2012). Salinity data for 100 m and 200 m stations (MP1-MP8) for August 2012. AdelaideAqua Pty Ltd.
2012_10_EPA_October_c_16.xlsx	AdelaideAqua, (2012). Salinity data for 100 m and 200 m stations (MP1-MP8) for October 2012. AdelaideAqua Pty Ltd.

Document Name	Reference
2012_11_EPA_November_c_16.xlsx	AdelaideAqua, (2012). Salinity data for 100 m and 200 m stations (MP1-MP8) for November 2012. AdelaideAqua Pty Ltd.
2012_12_EPA_December_c_16.xlsx	AdelaideAqua, (2012). Salinity data for 100 m and 200 m stations (MP1-MP8) for December 2012. AdelaideAqua Pty Ltd.
MP1.xlsx	AdelaideAqua, (2012). Conductivity and temperature data for 100 m station (MP1) for December 2012 to February 2014. AdelaideAqua Pty Ltd.
MP2.xlsx	AdelaideAqua, (2012). Conductivity and temperature data for 100 m station (MP2) for December 2012 to February 2014. AdelaideAqua Pty Ltd.
MP3.xlsx	AdelaideAqua, (2012). Conductivity and temperature data for 100 m station (MP3) for December 2012 to March 2014. AdelaideAqua Pty Ltd.
MP4.xlsx	AdelaideAqua, (2012). Conductivity and temperature data for 100 m station (MP4) for December 2012 to February 2014. AdelaideAqua Pty Ltd.

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

Licence 26902 & 39143: Covering the period 1-Dec-2010 to 31-Dec-2013; Measure conductivity and temperature of seawater at MP1, MP2, MP3 and MP4 every 10 minutes.

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 receiving environment as a basis for evaluating the performance of the diffuser.

Data have been collected from four locations (MP1-MP4) over the period 1-Jun-2011 to 31-Dec-2013 (Table 1). This covered the period of operational testing (noting that the first intake and discharge of seawater occurred on 1-Jun-2011; Appendix 1) through to commissioning and handover (12-Dec 2012) and over the first year of full operation (2013).

Four CTDs were moored at a series of locations 100 m to the North, South, East and West (MP1-MP4) of the discharge line and these CTDs provided observations of conductivity and temperature at 10 minute intervals. Over the initial period (up until December 2012) data was not recorded as conductivity and temperature but rather as salinity¹. Subsequently

¹ The CTD package used to obtain these records actually measures conductivity and temperature and then converts these values to salinity. On this basis it is assumed that, whilst salinity was actually recorded, the system obtained these estimates from measures of conductivity and temperature.

(since Dec 2012) the data have been recorded as separate conductivity and temperature measurements.

No attempt has been made to interpret the data other than to report the coverage of conductivity and/or temperature values (noting that data were provided for review in a series of EXCEL files as detailed above).

While there were some periods during which data coverage was incomplete, particularly during the commissioning stage, the overall coverage was good², comprising 85.5% of the period (Table 1) from 1-Jun-2011 to February 2014. There was only one period (September 2012) when no data were collected although data coverage in other months (prior to Dec-2012) was patchy (Table 1) with a number of months where data coverage from one or more sensors was deficient. Since December 2012 data coverage has been excellent (100%).

² Qualitative evaluation of the data coverage has been based on the following scale; Excellent $\geq 90\%$, Good $\geq 75\%$, Fair $\geq 60\%$, Materially 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	Overall %	Notes
2011_06	salinity_2011_jun	01/06/2011	30/06/2011	4,320	41%	0%	40%	0%	20%	1
2011_07	salinity_2011_jul	01/07/2011	31/07/2011	4,464	50%	9%	0%	16%	19%	1
2011_08	salinity_2011_aug	01/08/2011	31/08/2011	4,464	15%	51%	0%	42%	27%	1
2011_09	salinity_2011_sep	01/09/2011	30/09/2011	4,320	82%	48%	79%	66%	69%	1
2011_10	salinity_2011_oct	01/10/2011	31/10/2011	4,464	99%	37%	98%	72%	77%	1
2011_11	salinity_2011_nov	01/11/2011	30/11/2011	4,320	61%	92%	74%	95%	81%	1
2011_12	salinity_2011_dec	01/12/2011	31/12/2011	4,464	38%	67%	34%	41%	45%	1
2012_01	salinity_2012_jan	01/01/2012	31/01/2012	4,464	0%	62%	48%	34%	36%	1
2012_02	salinity_2012_feb	01/02/2012	29/02/2012	4,176	96%	98%	88%	86%	92%	1
2012_03	salinity_2012_mar	01/03/2012	31/03/2012	4,464	0%	86%	52%	96%	58%	1
2012_04	salinity_2012_apr	01/04/2012	30/04/2012	4,320	0%	0%	48%	48%	24%	1
2012-05	2012_5_Salinity_EPA_MM_MAY_CONDITION 16_17	01/05/2012	31/05/2012	4,464	27%	0%	29%	0%	14%	1
2012-06	2012_6_Salinity_EPA_MM_JUNE12_CONDITION 16_17	01/06/2012	30/06/2012	4,320	0%	0%	22%	85%	27%	1
2012-07	2012_7_EPA_MM_JULY12_CONDITION 16_17	01/07/2012	31/07/2012	4,464	59%	43%	0%	99%	50%	1
2012-08	2012_8_EPA_MM_AUGUST12_CONDITION 16_17	01/08/2012	31/08/2012	4,320	100%	100%	0%	100%	75%	1
2012-09	No file for September 2012	01/09/2012	30/09/2012	4,320	0%	0%	0%	0%	0%	2
2012-10	2012_10_EPA_October_c_16	01/10/2012	31/10/2012	4,464	0%	94%	98%	94%	71%	1
2012-11	2012_11_EPA_November_c_16	01/11/2012	30/11/2012	4,320	19%	74%	56%	74%	56%	1
2012-12	2012_12_EPA_December_c_16	01/12/2012	31/12/2012	4,464	52%	62%	62%	38%	54%	1
	MP1.xlsx	10/12/2012	25/02/2014	63,791	100%				100%	3
	MP2.xlsx	24/10/2012	25/02/2014	70,559		100%			100%	3
	MP3.xlsx	31/10/2012	25/03/2014	73,583			100%		100%	3
	MP4.xlsx	11/12/2012	25/02/2014	63,504				100%	100%	3
Compliance performance		01/06/2011	25/03/2014		64.3%	70.4%	69.4%	72.5%	69.2%	

Notes to Table 1:

- 1 Salinity values only provided – presumed to have been obtained from measurement of temperature and salinity.
- 2 Missing data
- 3 Conductivity and temperature records provided as per licence condition.
- 4 Expected record number is based on an assumption that observations are made every 10 minutes for the relevant time period.
- 5 Percentage values represent the number of valid observations for each sensor & 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