Review of seawater character - intake every 10 minutes monitoring licence conditions for the Adelaide Desalination Plant: June 2014

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Table of contents

EXECUTIVE SUMMARY

Purpose

This document represents a report on the extent to which monitoring of intake seawater character 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 intake seawater character (10 minute interval) monitoring encompassed a study of all documentation provided by AdelaideAqua Pty Ltd which comprised a series of 24 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:

EPA Licence 26902: Measure conductivity, temperature, pH & DO of seawater intake every 10 minutes at Ambient MP1. Where Ambient MP1 is the monitoring point in the desalination plant intake pipeline that connects the intake pumping station to the process plant.

EPA Licence 39143: Measure conductivity, temperature, pH & DO of seawater intake every 10 minutes at Ambient MP1. Where Ambient MP1 is the monitoring point in the desalination plant intake pipeline that connects the intake pumping station to the process plant.

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 data provided are largely consistent with the licence condition as defined under the Marine Monitoring Schedule (Attachment A) to the Licences. The specific requirements for this condition are to make measurements of conductivity, temperature, DO and pH every 10 minutes at Ambient MP1. Overall data coverage (i.e. the number of actual records as a percentage of those expected based on 10 minute interval observations) is good with average data coverage of 82% over the time during which readings were made.

Data from Ambient MP1 has been recorded over the two year period 01-Jan-2012 to 31-Dec-2013. There were a two periods where data were insufficient including:

1. Prior to 1-Jan-2012 when no data were recorded.
2. A poor level of coverage was obtained in April 2012 (37%) but it needs to be noted that the plant did not produce any drinking water during this month and the intake was only operating intermittently.

LICENCE CONDITION: SEAWATER CHARACTER - INTAKE EVERY 10 MINUTES MONITORING

In the following the specific requirements pertaining to the licence condition (seawater character - intake every 10 minutes) are summarised along with information about the documents that have been reviewed.

Documents reviewed for this licence condition:

Document Name	Reference
2013_01_EPA_January_c_8.xlsx	AdelaideAqua, (2013). Ambient Salinity Data from MP1 for January 2013. AdelaideAqua Pty Ltd. Note:
2012_10_EPA_October_c_8.xlsx	AdelaideAqua, (2012). Ambient Salinity Data from MP1 for October 2012. AdelaideAqua Pty Ltd. Note:
2012_11_EPA_November_c_8.xlsx	AdelaideAqua, (2012). Ambient Salinity Data from MP1 for November 2012. AdelaideAqua Pty Ltd. Note:
2012_12_EPA_December_c_8.xlsx	AdelaideAqua, (2012). Ambient Salinity Data from MP1 for December 2012. AdelaideAqua Pty Ltd. Note:
2012_2 EPA_February_Intake seawater characteristics 8.xlsx	AdelaideAqua, (2012). Ambient Salinity Data from MP1 for February 2012. AdelaideAqua Pty Ltd. Note:
2012_3 EPA_March_Intake seawater characteristics_conditon 8.xlsx	AdelaideAqua, (2012). Ambient Salinity Data from MP1 for March 2012. AdelaideAqua Pty Ltd. Note:
2012_4_EPA_APRIL_MM_CONDITON 8 VERIFIED.XLSX	AdelaideAqua, (2012). Ambient Salinity Data from MP1 for April 2012. AdelaideAqua Pty Ltd. Note:
2012_5_EPA_MAY_MM_CONDITON 8 VERIFIED.XLSX	AdelaideAqua, (2012). Ambient Salinity Data from MP1 for May 2012. AdelaideAqua Pty Ltd. Note:
2012_6_EPA_JUNE_MM_CONDITON 8 VERIFIED.XLSX	AdelaideAqua, (2012). Ambient Salinity Data from MP1 for June 2012. AdelaideAqua Pty Ltd. Note:
2012_7 EPA_JULY_MM_CONDITON 8 intake monitoring pH and DO.XLSX	AdelaideAqua, (2012). Ambient Salinity Data from MP1 for July 2012. AdelaideAqua Pty Ltd. Note:
2012_8 EPA_AUGUST_MM_CONDITON 8 VERIFIED intake monitoring seawater characteristics.XLSX	AdelaideAqua, (2012). Ambient Salinity Data from MP1 for August 2012. AdelaideAqua Pty Ltd. Note:
2012_1 EPA_January_Intake seawater characteristics_conditon 8.xlsx	AdelaideAqua, (2012). Ambient Salinity Data from MP1 for January 2012. AdelaideAqua Pty Ltd. Note:
2012_9_EPA_SEPTEMBER_CONDITON 8 Inatke monitoring pH and DO.XLSX	AdelaideAqua, (2012). Ambient Salinity Data from MP1 for September 2012. AdelaideAqua Pty Ltd. Note:
2013_12_EPA_December_c_8.xlsx	AdelaideAqua, (2013). Ambient Salinity Data from MP1 for December 2013. AdelaideAqua Pty Ltd. Note:
2013_02_EPA_February_c_8.xlsx	AdelaideAqua, (2013). Ambient Salinity Data from MP1 for February 2013. AdelaideAqua Pty Ltd. Note:
2013_03_EPA_March_c_8.xlsx	AdelaideAqua, (2013). Ambient Salinity Data from MP1 for March 2013. AdelaideAqua Pty Ltd. Note:
2013_04_EPA_April_c_8.xlsx	AdelaideAqua, (2013). Ambient Salinity Data from MP1 for April 2013. AdelaideAqua Pty Ltd. Note:
2013_05_EPA_May_c_8.xlsx	AdelaideAqua, (2013). Ambient Salinity Data from MP1 for May 2013. AdelaideAqua Pty Ltd. Note:
2013_06_EPA_June_c_8.xlsx	AdelaideAqua, (2013). Ambient Salinity Data from MP1 for June 2013. AdelaideAqua Pty Ltd. Note:
2013_07_EPA_July_c_8.xlsx	AdelaideAqua, (2013). Ambient Salinity Data from MP1 for July 2013. AdelaideAqua Pty Ltd. Note:
2013_08_EPA_August_c_8.xlsx	AdelaideAqua, (2013). Ambient Salinity Data from MP1 for August 2013. AdelaideAqua Pty Ltd. Note:

Document Name	Reference
2013_09_EPA_september_c_8.xlsx	AdelaideAqua, (2013). Ambient Salinity Data from MP1 for September 2013. AdelaideAqua Pty Ltd. Note:
2013_10_EPA_October_c_8.xlsx	AdelaideAqua, (2013). Ambient Salinity Data from MP1 for October 2013. AdelaideAqua Pty Ltd. Note:
2013_11_EPA_November_c_8.xlsx	AdelaideAqua, (2013). Ambient Salinity Data from MP1 for November 2013. AdelaideAqua Pty Ltd. Note:

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

EPA Licence 26902: Measure conductivity, temperature, pH & DO of seawater intake every 10 minutes at Ambient MP1. Where Ambient MP1 is the the monitoring point in the desalination plant intake pipeline that connects the intake pumping station to the process plant.

EPA Licence 39143: Measure conductivity, temperature, pH & DO of seawater intake every 10 minutes at Ambient MP1. Where Ambient MP1 is the the monitoring point in the desalination plant intake pipeline that connects the intake pumping station to the process plant.

Overall summary in relation to seawater character - intake every 10

A series of instruments have been deployed on the intake line SP1 to measure conductivity (PST-301-CIT-1501), temperature (PST-301-TIT-1501), pH (PST-301-AIT-1005) and DO (PST-301-AIT-1506) a similar series have been deployed on line SP2 (conductivity PST-301-CIT-2501, temperature PST-301-TIT-2501, pH PST-301-AIT-2005 and DO PST-301-AIT-2506). These inline meters represent the monitoring for “Ambient MP1”. For the purposes of this Licence condition the data have been validated against a series of reasonableness criteria and values that do not meet those criteria have been excluded. Percentage coverage has been determined based on the number of valid data records obtained as a percentage of the number of records expected given the times at which the plant was operating (based on the assumption that one data record would be required for each parameter for every 10 minutes of operation). Account has been taken of the differences in timing for the commissioning of SP1 and SP2.

The various instruments have a degree of overlap (redundancy in metering); on this basis a valid record has been assumed if at least one sensor of each type (conductivity, temperature, pH or DO) has a valid record during any 10 minute interval.

Monitoring of ambient water quality extends on the data collected in Condition 7 and is intended to provide data on the general physico-chemical properties of the intake water over the period of plant construction and operation up to the end of December 2013. In fact (and consistent with some other conditions), data has been recorded since January 2012 which is after the early phase testing (including first water runs; Appendix A) but before the major operational testing (SP1 and SP2 full production; Appendix A). No data were obtained for the period prior to 1-Jan-2012; it is notable that “First Water” occurred on 01-Jun-2011 and that operation of the plant was intermittent up until full production was achieved for SP1 (21-Mar-2012) and SP2 (31-May-2012). The data therefore substantively cover the periods during late phase testing and operational start-up.

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

Data provided broadly comprise readings from each of the various monitoring stations at 10 minute intervals over the period 1-Jan-2012 to 31-Dec-2013. There are a number of periods during which data were only available for a proportion of the time and these are detailed in Table 1 (% data coverage for each parameter; conductivity, temperature, pH and DO) which also provides an index of overall data.

Overall data coverage for Ambient MP1 (Table 1) was good[1] comprising an average coverage of 82%. In terms of each parameter coverage for conductivity was good (82%), temperature was excellent (97%), pH was good (89%) while DO was Fair (63%). It should be noted that measurements of DO are problematical with instruments typically needing a high level of maintenance and recalibration which inevitably results in down-time.

For most months overall coverage was excellent (>90% valid readings) and there was only 1 month (April 2012) when the data were materially deficient (37%) however, the plant did not produce any drinking water during this month and the intake was only operating intermittently.

[1] Qualitative evaluation of the data coverage has been based on the following scale; Excellent >= 90%, Good >=75%, Fair >= 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 8 Ambient MP1 Seawater characteristics (conductivity, temperature, pH and dissolved oxygen) with data as percentages of operating.

Month and year	File	Record Number	Operating records	Percentage of valid readings				
				Conductivity %	Temperature %	ph %	DO %	Overall %
2012-01	2012_1 EPA_January_Intake seawater characteristics_conditon 8	4,464	844	0%	100%	77%	61%	60%
2012-02	2012_2 EPA_February_Intake seawater characteristics 8.xlsx	4,167	1,055	16%	100%	87%	65%	67%
2012-03	2012_3 EPA_March_Intake seawater characteristics_conditon 8.xlsx	4,464	1,247	56%	99%	99%	56%	78%
2012-04	2012_4_EPA_APRIL_MM_CONDITON 8 VERIFIED.XLSX	4,420	569	16%	100%	16%	16%	37%
2012-05	2012_5_EPA_MAY_MM_CONDITON 8 VERIFIED.XLSX	4,464	3,524	95%	100%	94%	10%	75%
2012-06	2012_6_EPA_JUNE_MM_CONDITON 8 VERIFIED.XLSX	4,320	4,320	92%	91%	82%	0%	66%
2012-07	2012_7 EPA_JULY_MM_CONDITON 8 intake monitoring pH and DO.XLSX	4,464	4,097	100%	99%	97%	0%	74%
2012-08	2012_8 EPA_AUGUST_MM_CONDITON 8.XLSX	4,321	4,085	100%	99%	73%	97%	92%
2012-09	2012_9_EPA_SEPTEMBER_CONDITON 8 Inatke monitoring pH and DO.XLSX	4,320	3,318	95%	99%	90%	45%	82%
2012-10	2012_10_EPA_October_c_8.xlsx	4,458	3,445	83%	99%	90%	56%	82%
2012-11	2012_11_EPA_November_c_8.xlsx	4,320	2,592	56%	99%	99%	14%	67%
2012-12	2012_12_EPA_December_c_8.xlsx	4,464	3,714	76%	100%	98%	62%	84%
2013-01	2013_01_EPA_January_c_8.xlsx	4,464	4,439	99%	99%	97%	67%	91%
2013-02	2013_02_EPA_February_c_8.xlsx	4,032	4,006	100%	100%	100%	92%	98%
2013-03	2013_03_EPA_March_c_8.xlsx	4,464	4,104	99%	99%	99%	89%	97%
2013-04	2013_04_EPA_April_c_8.xlsx	4,326	2,940	85%	79%	79%	64%	77%
2013-05	2013_05_EPA_May_c_8.xlsx	4,464	4,433	93%	93%	93%	85%	91%
2013-06	2013_06_EPA_June_c_8.xlsx	4,320	2,411	98%	98%	98%	98%	98%
2013-07	2013_07_EPA_July_c_8.xlsx	4,464	4,187	95%	95%	94%	95%	95%
2013-08	2013_08_EPA_August_c_8.xlsx	4,464	3,424	98%	98%	98%	81%	94%
2013-09	2013_09_EPA_september_c_8.xlsx	4,420	3,539	79%	79%	78%	78%	79%
2013-10	2013_10_EPA_October_c_8.xlsx	4,458	4,456	100%	100%	100%	100%	100%
2013-11	2013_11_EPA_November_c_8.xlsx	4,320	4,320	100%	100%	99%	100%	100%
2013-12	2013_12_EPA_December_c_8.xlsx	4,464	4,464	98%	99%	98%	90%	96%
Compliance performance (totals and other statistics)		**105,306**	**79,533**	**80%**	**97%**	**89%**	**63%**	**82%**

Notes to Table 1:

1. "Record Number" values in red indicate that there were fewer observations than expected given the number of days in the month. In such cases the percentage values only account for the number of operating records (ignoring missing data records). While somewhat conservative, in each case the number of missing data records is not material.

1. "Operating records" represents the number of records taken while either SP1 or SP2 was operating.
2. "Overall %" is the measure of compliance in that it defines whether or not there is at least one sensor providing a continuous record for Ambient MP1.
3. All other percentage values represent the proportion of records obtained for each sensor type (while the plant is actually operating) that meet the basic validation rules developed for this licence condition.

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