

# Barossa Infrastructure Limited

## Gomersal Recycled Water Reuse Scheme

### Audit Report (2017/18)

21 September 2017

***Commercial in Confidence***

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## Audit Report (2017/18)

Prepared for

Barossa Infrastructure Limited

By

Seed Consulting Services Pty Ltd

21 September 2018

## Document Control

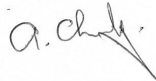
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# 1. Introduction & Background

Seed Consulting Services (Seed) was engaged to undertake an independent review (audit) of the management of the Barossa Infrastructure Limited (BIL) Wastewater Reuse Scheme for the 2017/18 year.

The Barossa Council injects Community Wastewater Management Scheme (CWMS) water from The Barossa Council's Nuriootpa CWMS scheme into the BIL Gomersal Road pipeline where this CWMS water is blended with BIL water (unfiltered River Murray water) and then delivered as a blended product to BIL customers along Gomersal Road.

The operation of the wastewater reuse scheme was approved by Department of Health (SA) in August 2009 (approval number 2009-7292) as part of a Risk Management Plan (RMP) and Wastewater Irrigation Management Plan (WIMP) framework under the authorisation. The RMP and WIMP were successfully reviewed and updated in 2016.

The SA Health approval was subject to 8 conditions of operation, including that:

- The Risk Management Plan and operating procedures are maintained onsite for use by the system operator/maintenance personnel,
- Irrigation is by 'drip' irrigation only, and that properties using the recycled water display appropriate signage, ensure there is no runoff, fence dams and paint exposed pipework lilac,
- Water quality parameters must not exceed certain criteria, including limits set for BOD, suspended solids, coliforms, and chlorine content.

These conditions have been considered in this audit report, however it should be noted that a thorough inspection and assessment for each private user of the wastewater has not been carried out; instead general consultation with randomly selected users has been undertaken.

This report provides a summary of volumes of wastewater supplied under the Wastewater Reuse Scheme and water quality parameters for the operational period of the 2017/18 financial year.

## 2. Recycled Water Supplied to Users

BIL customers are supplied with water transported from the River Murray via the Warren Reservoir by SA Water (raw water) and distributed via the BIL network. In 2017/18, BIL customers in the Gomersal area received a total of approximately 2,309 ML of irrigation water made up of 2,049 ML of raw water and 260 ML of treated effluent water from the Nuriootpa Wastewater Treatment Plant (CWMS). On average (17/18), treated water comprised 11% of all irrigation water delivered to BIL Gomersal Road customers.

A monthly comparison of the total volume of water supplied versus the volume of treated effluent is provided in Table 1.

**Table 1: 2017/18 Monthly Supply of Water to Gomersal Road BIL Customers**

Month	Total BIL (ML)	Treated Effluent Volume (ML)	Treated Effluent (%)
July 2017	-	-	-
August	41.612	12	22
September	158.012	21	12
October	158.354	35.5	18
November	88.850	23.6	21
December	165.175	25	13
January 2018	262.147	22	8
February	527.463	22	4
March	261.031	10.5	4
April	75.972	16.7	28
May	84.428	20	23
June 2018	226	52	41
<b>Total (2309 ML)</b>	<b>2049.044</b>	<b>260.3</b>	<b>11%</b>

A total of 2309 ML was supplied to meet demand, of which 260 ML was CWMS water representing 11% of total water delivered. This volume of take (CWMS) was consistent with the annual contracted volumes, which are between 265ML (annual minimum) and 304ML (annual maximum), of which both volumes are subject to change by mutual agreement. Due to a combination of dryer summer conditions and an increase in planted vineyard area (ha) being supplied, a higher component of raw BIL water was consumed in the summer irrigation season. Consequently this resulted in a lower percentage (11%) of CWMS compared to the total water used. The annual dilution benchmark is 14%.

## 3. Water Quality Parameters

The following section provides a summary of the water quality parameters considered in our review and is sourced from data provided by The Barossa Council and BIL. Analysis of water samples was conducted at the Australian Water Quality Centre, AWQC, (NATA certified).

Table 2 provides a summary of the water quality parameters for the Wastewater Reuse Scheme for the 2017/18 financial year.

No odour or algae issues of significance were reported by BIL customers in the 2017/18 year. See notes on customer discussions (Appendix D).

BIL can inject CWMS water for irrigation water use in the Gomersal area so long as the water quality limits, detailed in SA Health approval number 2009-7292 are met. The conditions of the approval are summarised below:

- The mean BOD was 14.2 mg/L. The SA Health trigger is 20 mg/L. Sampling indicated a reading of 37 mg/L BOD for June 2017. This was checked with the Barossa Council and no abnormal operational events could be identified.
- A mean for suspended solids of 30.1 mg/L was calculated. The SA Health trigger is 30mg/L. Barossa Council has indicated that this was due to higher temperatures encouraging higher algal levels.
- A median E. coli not greater than 0/100 mL. The SA Health trigger is 100/100 mL, December 2017 recorded a result of 31/100mL and April 2018 24/100mL. Barossa Council has not recorded any issue with chlorination. The Barossa Council recorded normal chlorine readings at the chlorinator in these periods. This may have occurred due to sample contamination but both readings remain below the SA Health trigger. All other months were well within expectations.
- A mean total Chlorine not less than 1 mg/L (satisfied). The SA Health trigger is 1 mg/L.

Given the 11% dilution factor, water reaching vineyards for irrigation use is likely to be at concentrations substantially lower for all parameter measured. For BIL customers who undertake their own additional water quality testing, none reported parameters of concern.

### 3.1 Water Quality Results Collected by Barossa Council

The Barossa Council collects water samples for analysis from the Nuriootpa CWMS Treatment Plant final lagoon, prior to the connection point to the BIL scheme.

Given there is significant dilution of the treated wastewater once connected into the BIL Gomersal main, the Barossa Council test results are considered the “worse case” scenario for water quality.

The Barossa Council took samples on a monthly basis, from July 2017 to and including June 2018. A summary of the test results for water quality parameters required to be met under

the SA Health approval is provided in Table 2. Several parameters and associated limits are also illustrated in figure 1 and figure 2.

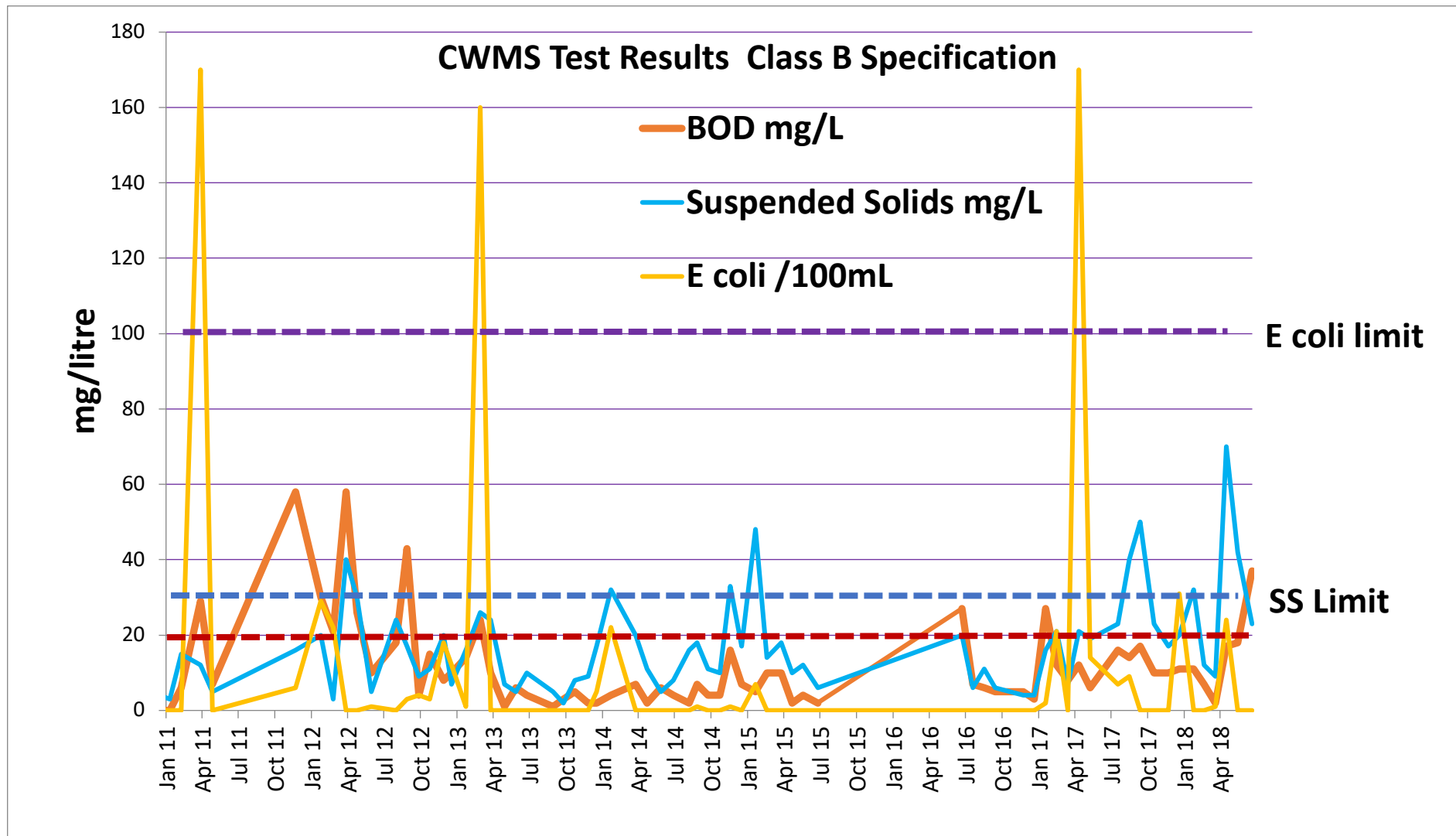
Full laboratory test results were not provided but a detailed BIL summary spreadsheet of the test results is provided in Appendix A. Barossa Council also tested other parameters (i.e. metals), which are provided in Appendix B.

**Table 2:** Summary Water Quality Test Results applicable to SA Health approval (Nuriootpa Community Wastewater Management Scheme CWMS (Treatment Plant, Final lagoon))

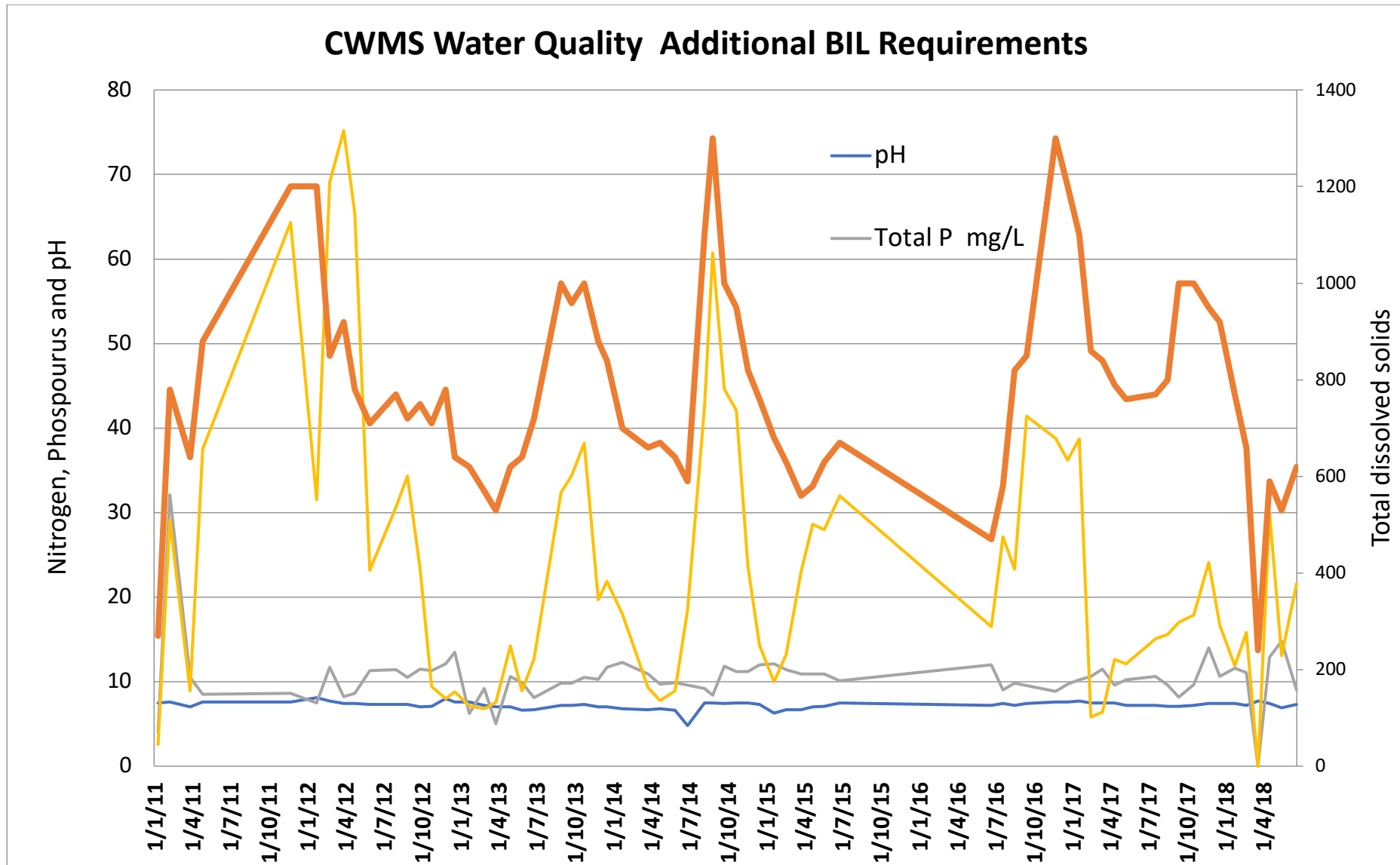
Water Quality Parameters 2017_2018							
Testing date	BOD (mg/L)	Suspended Solids (mg/L)	E. coli (count per 100mL)	Free Chlorine (mg/L) <sup>1</sup>	TDS (mg/L)	Total N (mg/L)	Total P (mg/L)
July 2017	16	23	7	1	770	15.1	10.6
August	14	40	9	1	800	15.6	9.57
September	17	50	0	1	1000	17	8.15
October	10	23	0	1	1000	17.9	9.64
November	10	17	0	1	950	24.1	14
December	11	20	31	1	920	16.7	10.6
January 2018	11	32	0	1	770	11.9	11.6
February	7	12	0	1	660	15.8	11.1
March	2	9	1	1	240	<2.0	<0.1
April	17	70	24	1	590	30	12.9
May	18	42	0	1	530	13.1	14.8
June	37	23	0	1	620	21.6	9
<b>Mean / Median</b>	14.2	30.1	6	1	738.0	18.1	11.1
<b>Limits and Trigger Values</b>	<b>20 mg/L</b> SA Health Limit	<b>30 mg/L</b> SA Health Limit	<b>100</b> SA Health Limit	<b>1.0 mg/L</b> SA Health Limit	<b>1,450 mg/L</b> Risk Plan Trigger		

<sup>1</sup> Free chlorine average unable to be determined as data only provided in 1 or >1 format.





**Figure 1.** CWMS BOD, Suspended Solids, and E coli test results and limits. Please note there is a gap in data from 25/6/2015 to 21/06//2016 being outside a reporting period



**Figure 2.** CWMS pH, Total P, Total N, and TDS test results. Please note there is a gap in data from 25/6/2015 to 21/06/2016 being outside the reporting period

**Table 3:** Summary Water Quality Test Results applicable to SA Health

**Approval Inorganic Chemistry – Metals: BIL Sample**

Date	INORGANIC CHEMISTRY METALS		Cadmium	Calcium	AWQC DATA **BIL SAMPLE	
	Arsenic	Boron			Chromium	Lead
*LOR mg / L	0.0003	0.020	0.0001	0.10	0.0001	0.0001
20/05/2016	<0.0003	0.0270	<0.0001	8.40	<0.0001	0.0004
16/09/2016	0.0005	0.0320	<0.0001	13.00	0.0015	0.0015
11/11/2016	0.0012	<0.020	<0.0001	8.10	0.0034	0.0048
13/01/2017	0.0015	0.0280	<0.0001	12.10	0.0026	0.0016
17/03/2017	0.0017	0.0320	<0.0001	13.00	0.0013	0.0029
12/05/2017	0.0009	0.0400	<0.0001	14.10	0.0011	0.0024
24/07/2018	0.0006	0.121	<0.0001	25.9	0.0005	0.0008

**Table 4:** Summary Water Quality Test Results applicable to SA Health

**Approval Inorganic Chemistry – Metals: CWMS Sample**

Date	INORGANIC CHEMISTRY METALS		Cadmium	Calcium	AWQC DATA ***CMS SAMPLE	
	Arsenic	Boron			Chromium	Lead
*LOR mg / L	0.0003	0.020	0.0001	0.10	0.0001	0.0001
14/07/2017	0.0004	0.1410	<0.0001	33.00	0.0004	0.0011

\*LOR: Limits Of Reporting

\*\*BIL sample taken from connection point

\*\*\* CWMS Sample

A recommendation from the 2014/2015 report suggested collecting data on “Heavy Metals”. This action has subsequently occurred annually with sampling at the CWMS (Table 4) (24/07/2018) and at the BIL connection point. AWQC provided analysis data on the following inorganic metals: arsenic, boron, cadmium, calcium, chromium, iron, lead, magnesium, manganese, potassium, sodium, sulphur, zinc. For the benefit of this report data was summarised on arsenic, boron, cadmium, calcium, chromium, lead (Table 3 & 4).

## 3.2 Summary of Water Quality Analysis

### 3.2.1. BOD, Suspended Solids and E. coli

*The mean BOD and suspended solids and median E. coli levels did not exceed the SA Health approval limits.*

BOD and suspended solid information is based on fundamental data, means are calculated from this data.

All but one month (June 2018, 37 mg/L) BOD water quality parameters supplied by Barossa Council did not exceed the SA Health approval limit of 20 mg/L for this reporting period. The mean was 14.1 mg/L.

The mean suspended solids count (30.1 mg/L) was right on the SA Health approval limit (30.0 mg/L) for this reporting period. This has triggered investigation with The Barossa Council. Council advised that the chlorinator is performing as designed and outliers may have been as a consequence of sample contamination or higher temperatures creating algal growth.

The median E. coli count (6/100 mL) did not exceed the SA Health approval limits at any time during the reporting period. December did record a 31/100 mL count; the SA Health limit is 100/100 mL. This was most likely due to sample contamination. Given the likely influence of this outlier on calculating a mean it was considered more accurate to calculate the median.

### 3.2.2. Chlorine

*Higher chlorination levels would be required to satisfy the SA Health approval criteria.*

Barossa Council operates a chlorine dose trimming system. Chlorine dosing did not exceed SA Health requirements and E Coli results are well within requirements although two elevated readings were reported (December 2017 & April 2018). This result would suggest chlorine dosing and E Coli control is well managed. Free chlorine is calculated on the basis of 1 or <1 not actual raw data. Therefore a median figure has been calculated.

### 3.2.3 Salinity

*The salinity trigger point specified in the Risk Plan was not reached.*

The Risk Management Plan operated by BIL specifies that salinity testing will be required downstream of the point of injection if salinity in the Council operated final lagoon exceeds 1,450 mg/L. The average TDS was 737 mg/L (results supplied by Barossa Council) well within the trigger point of 1,450 mg/L.

### 3.2.3. Heavy Metals

*Future reporting of Heavy Metals may assist some growers with company and/or product reporting.*

Tables 3 and 4 summarise heavy metal data for BIL and CWMS water. This is the second year this data has been reported. No trends are obvious given the limited sample sets.

# 4. Recommendations Review

## 2017/18

This independent review of the management of the Barossa Infrastructure Limited (BIL) Gomersal Road Wastewater Reuse Scheme for the 2017/18 year, has identified that on average all water quality parameters and requirements are within the required limits. Outliers were identified and explanations noted.

Recommendations from 2016/17 and actions taken:

In order to ensure ongoing compliance with SA Health and BIL's Wastewater Reuse Scheme requirements and conditions, the following is recommended:

- Review wastewater scheme operations and related landownership to ensure the requirements of the WIMP and RMP are met, including consultation and communication as appropriate.  
**Action: New users and a random selection of existing users were contacted September 2018 to confirm operational understanding (See notes Appendix D);**
- Ongoing water quality monitoring to ensure the SA Health criteria are not exceeded, including limits set for BOD, suspended solids, coliforms, and chlorine content.  
**Action: CWMS water quality data collected and reported in this report. Investigated elevated Suspended Solids with The Barossa Council;**
- We recommend that the review period actions be implemented within six months of this report to enable any changes to the RMP and WIMP's to be adopted prior to 2018/19 audit reporting.  
**Action: Implement WIMP review prior to December 2018, including soil analysis as part of the 18/19 annual audit.**

**APPENDIX A.** The Barossa Council Monthly Water Quality Test Results, Summary of water quality testing results 2017/18.

Date	Ammonia as N	BOD	Ca	COD	Conductivity	E. coli	Grease & Oil	Mg	N+N as N	Nitrate as N	Nitrite as N	pH	Phos. Total	Sodium	SAR	SS	TKN as N	TDS
	mg/L	mg/L	mg/L	mg/L	uScm	100mL	mg/L	mg/L	mg/L	mg/L	mg/L	Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
18/07/2017	8.97	16	32.6	86	1390	7	6	24.2	6.36	2.85	3.51	7.2	10.6	178	5.76	23	15.1	770
16/08/2017	7.42	14	33.2	115	1450	9	<1	26	24.1	18.8	5.29	7.1	9.57	188	5.94	40	15.6	800
12/09/2017	10.4	17	38.8	127	1810	0	6	32.9	7.44	7.22	0.223	7.1	8.15	212	6.05	50	17	1000
17/10/2017	8.11	10	39	101	1820	0	3	33	2.41	2.1	0.311	7.2	9.64	215	6.13	23	17.9	1000
22/11/2017	10.7	10	37.1	97	1720	0	2	30.7	<0.06	<0.06	<0.06	7.4	14	216	6.35	17	24.1	950
19/12/2017	11.3	11	39.6	94	1660	31	<1	30.7	<0.06	<0.06	<0.06	7.4	10.6	199	5.77	20	16.7	920
24/01/2018	8.89	11	34.5	99	1400	0	5	25.1	<0.06	<0.06	<0.06	7.4	11.6	170	5.37	32	11.9	770
20/02/2018	12.2	7	28.1	67	1200	0	<1	17.7	0.06	<0.06	<0.06	7.2	11.1	135	4.91	12	15.8	660
20/03/2018	0.63	2	11.4	33	443	1	<1	7.74	0.25	0.19	<0.06	7.7	<0.1	41	2.3	9	<2.0	240
17/04/2018	18.5	17	24.8	156	1070	24	6	13.8	<0.06	<0.06	<0.06	7.4	12.9	123	4.91	70	30	590
15/05/2018	3.97	18	23.8	124	967	0	<1	13.7	11.15	10.14	1.01	6.9	14.8	120	4.85	42	13.1	530
20/06/2018	17.3	37	26.3	84	1130	0	<1	15.4	0.99	0.54	0.45	7.3	9	125	4.79	23	21.6	620

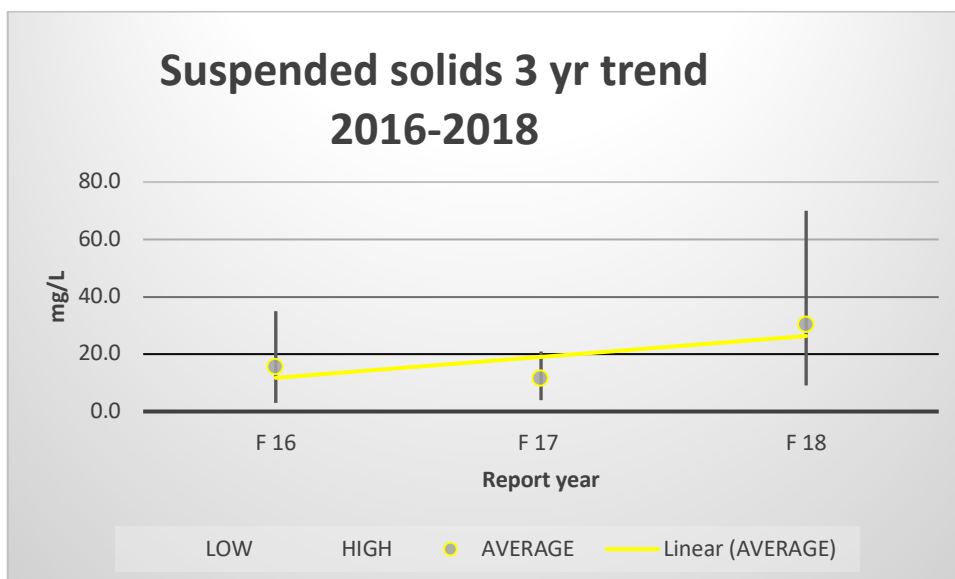
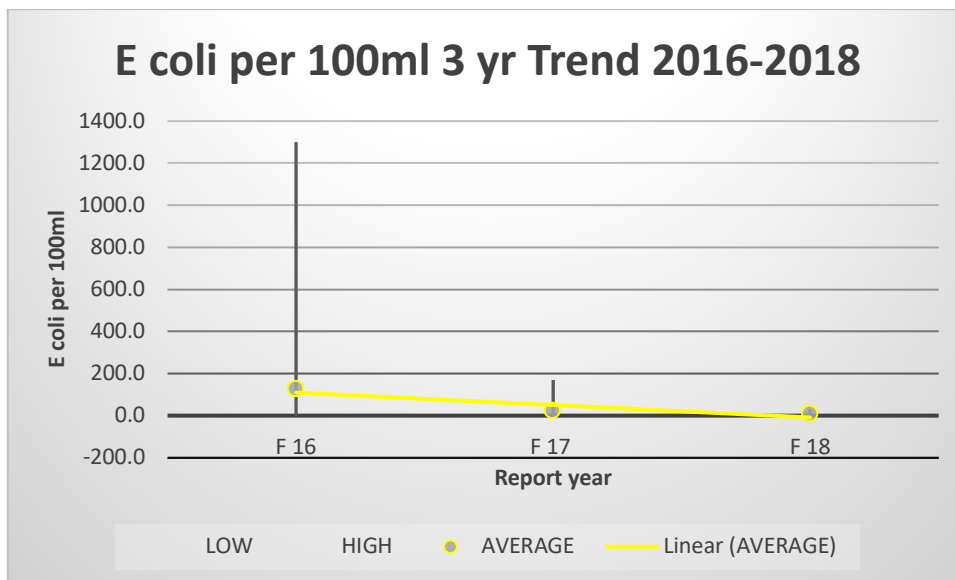
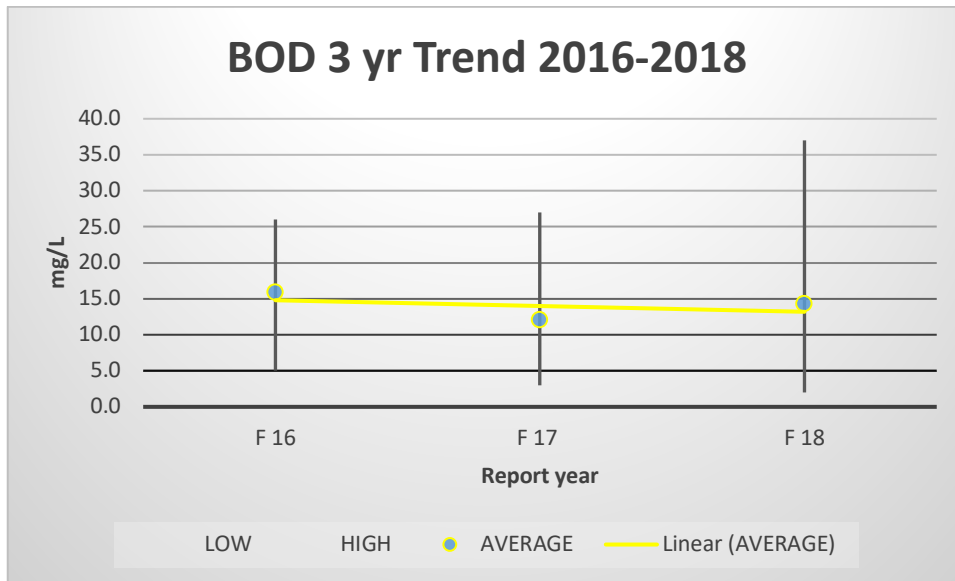
## APPENDIX B. The Barossa Council Water Quality Test Results, Heavy Metals.

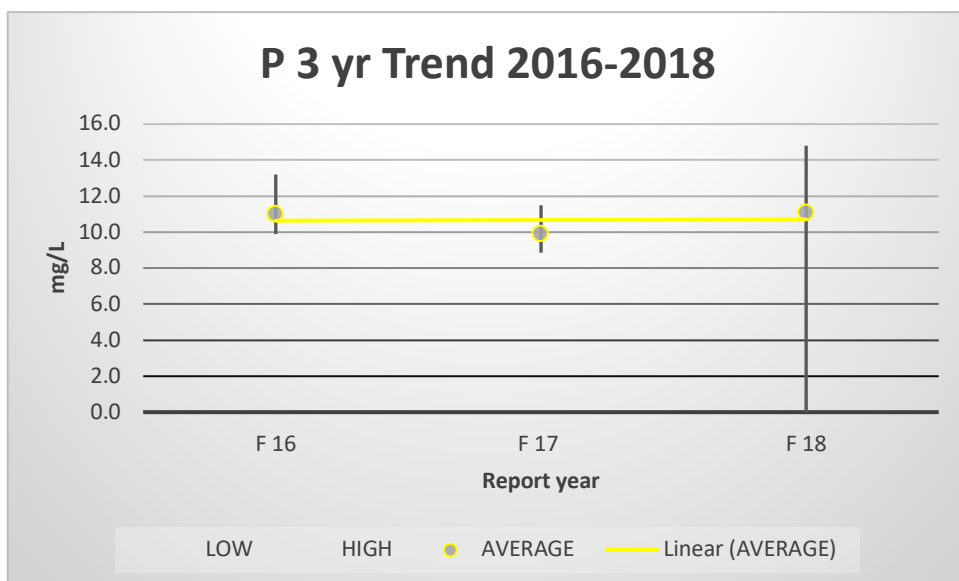
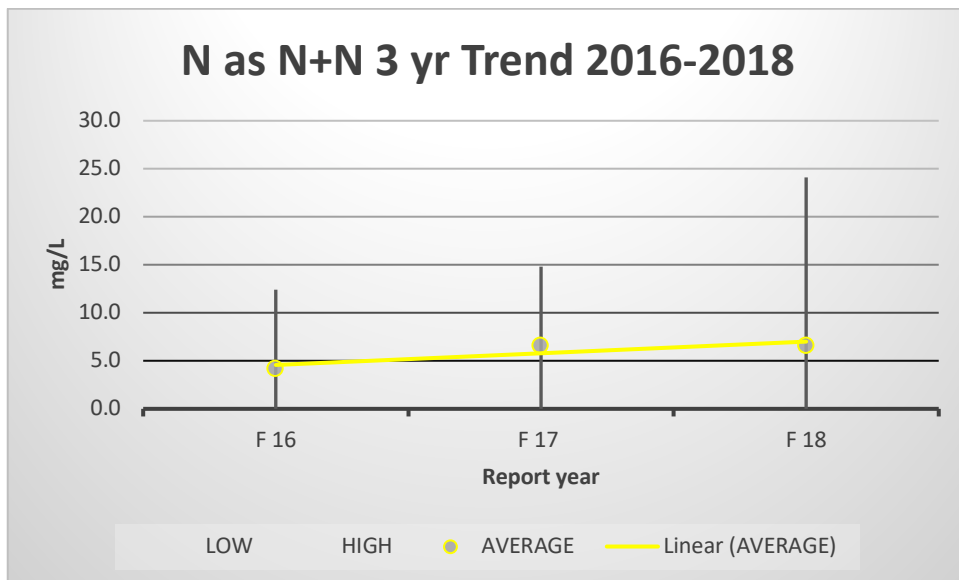
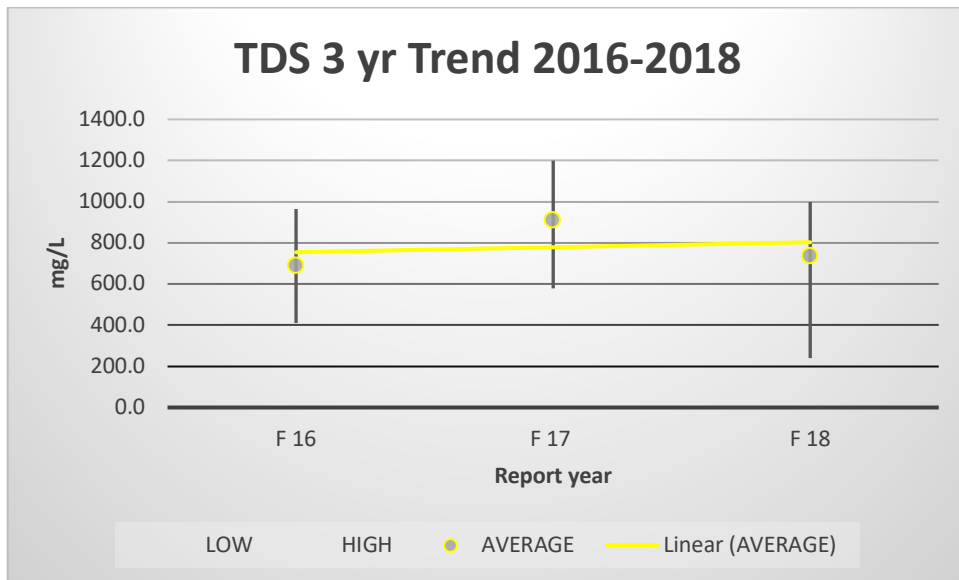
Barossa Council is contracted to provide one set of metals sample per year. Appendix B provides this data for samples taken 24/07/2018 at the BIL discharge point.

METAL	LOR	Result Mg/L
Aluminium	0.001	0.087
Arsenic	0.0003	0.0006
Beryllium	0.0003	<0.0003
Boron	0.020	0.121
Cadmium	0.0001	<0.0001
Calcium	0.1	25.9
Chromium	0.0001	0.0005
Cobalt	0.0001	0.0002
Copper	0.0001	0.0171
Iron	0.0005	0.1220
Lead	0.0001	0.0008
Lithium	0.0003	0.0060
Magnesium	0.05	18.1
Manganese	0.0001	0.0331
Mercury	0.00003	<0.00003
Molybdenum	0.0001	0.0003
Nickel	0.0001	0.0018
Selenium	0.0001	0.0002
Sodium	0.1	144
Uranium	0.0001	0.0003
Vanadium	0.0001	0.0008
Zinc	0.0003	0.0834



**APPENDIX C. 3 Year Averages for BOD, E coli, Suspended Solids, TDS, N as N+N, P : 2016 -2018**





## **APPENDIX D.** Notes on BIL customer discussions.

A number of growers were randomly selected and their views collected on performance of the BIL Gomersal pipeline delivery of water as well as their management of the resource.

- All indicated no significant issues in terms of major emergencies and hazard to people or the environment.
- All indicated they understood the water contained recycled water and it represented a hazard albeit in dilute form.
- All except one property had signage in place and above ground headworks were painted lilac. The property without signage made a commitment to action provision of signage.
- All growers indicated that their employees and visitors to the site knew recycled water was being used on the property. One grower address this formerly by making it part of a signed off induction package.
- All growers had isolation valves at the infeed to their properties which could be readily accessed to shut of flow in case of an emergency, and they knew who to call to alert BIL of an emergency.
- All growers were happy with the level of communication and support from BIL.
- All growers were happy with the overall quality of water but recognised that water quality varied at times in terms of clarity because that represented issues with filtration issues. At peak demand times water flow decreased. There was one event where odour was noticed, but this was a transient.
- All growers acknowledged that without this resource provided by BIL there business would be significantly affected. This means there is a high level of engagement with high quality management of the resource.