Coleambally IRRIGATION

ANNUAL COMPLIANCE REPORT

2017

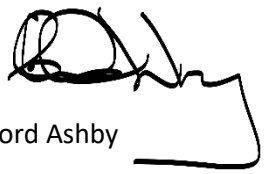
Contents

Statement of Compliance

The Annual Compliance Report 2016/17 is provided to meet the reporting requirements of Coleambally Irrigation Co-Operative Limited (CICL) against operating licences held with –

1. NSW DPI Water Combined Water Supply Work Approval and Water Use Approval No 40CA401473 (Murrumbidgee regulated river water source) and Combined Water Supply Work Approval and Water Use Approval for Groundwater extraction 40CA403808 40WA404593; and
2. NSW EPA , EPL No 4652

I am pleased to advise that from 1st July 2016 to 30th June 2017, CICL has complied with all monitoring and reporting requirements of the Water Access Licences, Water Supply Works, 40CA401473 Approval 2012, Groundwater Works Approvals 40CA403808 and 40WA404593 and Environment Protection Licence EPL (4652) issued by the NSW Government. To the best of my knowledge the information presented in this report is certified as being complete, true and accurate.



Clifford Ashby

Chief Executive Officer

1. Compliance Conditions

DPI Groundwater Approval 40CA403808 & 40WA404593				
Condition	***Condition No***	***Compliant***	***ACR Reference***	***Comment***
Measurement & reporting of annual volume and water quality	10 &11	✓	Section 7	WaterNSW owned compliant meters. Water quality measured periodically with a hand held meter.
Measure Volume extracted and not to exceed extraction limit	18	✓	Section 7	Compliant meters and extraction volumes within limits
Notification and reporting or non-compliant events		✓		No non-compliant events
DPI Regulated River Works and Water Use Approval No 40CA401473				
Install, maintain and operate an approved metering device at licenced extraction point	5	✓	Volumes extracted reported in Appendix A1	CICL operate a high accuracy meter with a secondary meter as a back up, both compliant to AS 4747.
Demonstrate that the meter is accurate to NSW Standards and validated by a certified person	6	✓	Appendix 6	Validated monthly by a Certified Practicing Hydrographer
Advise WaterNSW if meter fails	7	✓		Meter remained functional and accurate
Provide details of – • Quantity of water extracted • Water delivery infrastructure • Cropping details	8	✓	Table 4.11 Appendix 6 Crop areas and water use – Table 4.15	Volume extracted measured with accurate meter. Crop areas are estimates provided by farmers at commencement of irrigation
Modification or construction of works for discharge of water	9	✓		No modification or construction of works
Notification of reportable event	10	✓		No reportable events
Submission of Annual Compliance Report	11	✓		
Plan of operations and works	12.1 & 12.2	✓	Figure 3.3	CICL Works have remained unchanged for 2016/17
Statement of compliance	12.3	✓		
Presentation of data and analysis	12.4 – 12.8	✓	Appendices	Printed summary of all data provided in Appendices and digital copied emailed
Advise of any new measure implemented to limit groundwater recharge and salt discharge	12.9	✓		No new measures implemented
Reporting on works	12.10 – 12.13	✓	Sect 4 & 5	ACR reports – Volume extracted, all water discharges and deliveries, water balance and cropping areas
Reporting on salinity and salt load	12.14 – 12.16	✓	Section 6	
Reporting on groundwater conditions	12.17	✓	Section 7	Bi –annual measurement. (xls file accompanying report)
QA of monitoring and reporting	13	✓		QA stds applied through calibration and validation
Reporting of noxious aquatic weeds and blue green algae	15 & 16	✓		There were no noxious aquatic weeds events
Monitoring and reporting of all discharge points	Attachment 1	✓	Section 6 Print summary in Appendices and digital copies emailed	Report covers flow and salinity from all licence points
Monitoring and reporting of ground water	Attachment 2	✓	Section 7	Report cover all piezometer levels and reports changes and trends

EPA Operating and Reporting Requirements				
Condition	***Section***	***Compliant***	***ACR Reference***	***Comment***
Report on licenced discharge points flow and water quality	Sect 2 P1.1 – P1.2	✓	Section 4 and appendices	CODD, DC800, CCD, CODO, Continuous Flow and EC
Monitoring & Recording Conditions				
Monitor concentrations of pollutants discharged	M2.1 – 2.5	✓	Appendices	Routine and event sampling undertaken to meet licence requirements
Specific Molinate sampling	M4	✓	Appendix 5	Completed in accordance to specified requirements M4
Continuous recording of flow at licenced discharge points	M7	✓	Appendices	Completed

2. Executive Summary

2016/17 was a year of 100% General Security allocation. Rainfall totals in the district were above average with 448.4mm recorded for the year which is approximately 50mm above the Coleambally long term average (LTA) of 399.7mm. The highest monthly rainfall for the period was recorded in September with 115mm. The latter half of 2016 saw rainfall mostly above average for each month, in contrast the January – June rainfall of 140.8mm was 55mm below the seasonal LTA. The total evaporation for 2016/17 was 1698.9mm which was only slightly below the LTA of 1715.3mm

This rainfall and evaporation data is from the CICL 'Depot' daily read weather station.

The area under cropping in CICL's Area of Operations was 48,100 ha, compared to 32,720 ha in 2015/16. Rice continued to be the predominant crop both in area and water use.

Table 2.1 Top 5 Crop Area's, Intensity, ML Total and % of Total Use 2016/17

Crop	Area (Ha)	Intensity (ML/Ha)	Total ML	% Total Use
Rice	11,484	15.14	173,843	53.6%
Pasture	10,679	1.23	13,145	4.1%
Wheat	8,462	1.35	11,450	3.5%
Cotton	6,623	8.77	58,060	17.9%
Corn	5,105	8.55	43,654	13.5%

NOTE: the above cropped areas are based on customer estimate at the start of the season. These figures, are then ground truthed but should only be used as estimates

The key water statistics for the year 2016/17, for the purpose of comparison, are indicated in the following table:

Table 2.2 Water Usage

Key Statistics	2016/17	2015/16
Final Allocation	100%	37%
Metered net diversions into the Area of Operations	329,530 ML	219,658 ML
Metered usage to customers	323,341 ML	183,687 ML
Net channel losses	11,900 ML	35,971 ML
Ground water usage within Area of Operations*	*	89,630 ML
Ground water usage in CIA	21,385 ML	36,484 ML**

**Groundwater usage figures is not made available from NSW DPI- Water*

*** 2015/16 figures adjusted to match data provided to remain comparable.*

Despite 100% allocation and a wetter 2017 winter than average, the area of CIA where shallow water table is within two metres of the surface remained relatively unchanged from 2015/16. This year the total area where the water table was within two metres of the surface is approximately 2,818 ha, (3% of total area) as compared to 2,582 ha in 2015/16.

There were six reportable water quality incidents in 2016/17 involving the detection of Metolachlor, Atrazine and Diuron at our licenced discharge points.

3. Introduction

3.1 General

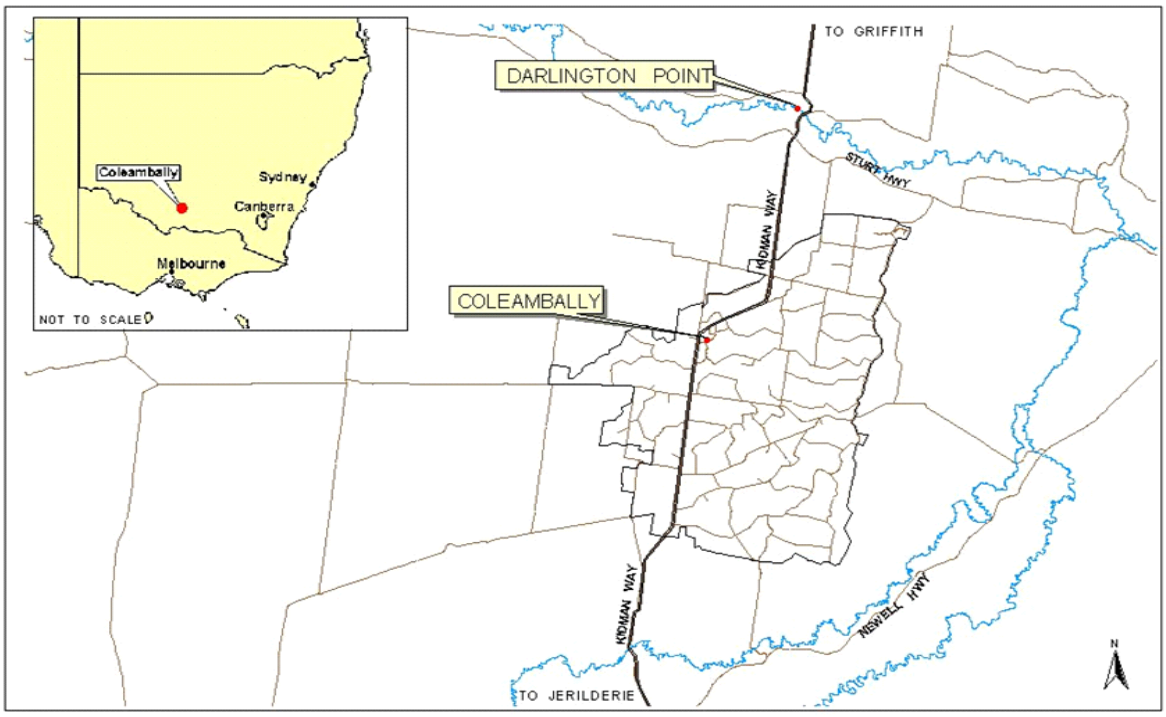
This is CICL's 20th Annual Compliance Report (ACR)[1] and submitted to demonstrate CICL's compliance with the following licences:

- Operating Licences, as issued by the NSW DPI Water Access Licences and Nominated Works and Water Use Approvals issued under the Water Management Act 2000 – specifically, amended approval 40CA401473 of August 2012 (herein referred to as 'approval 2012'), approval 40CA403808 (amended 2016) and 40WA404593 (issued 15 March 2011);
- Environment Protection Licence (EPL) # 4652 issued by the Environment Protection Authority, under the Protection of Environment Operations Act 1995 (POEO Act before 1995)

Coleambally Irrigation Area of Operations and Location

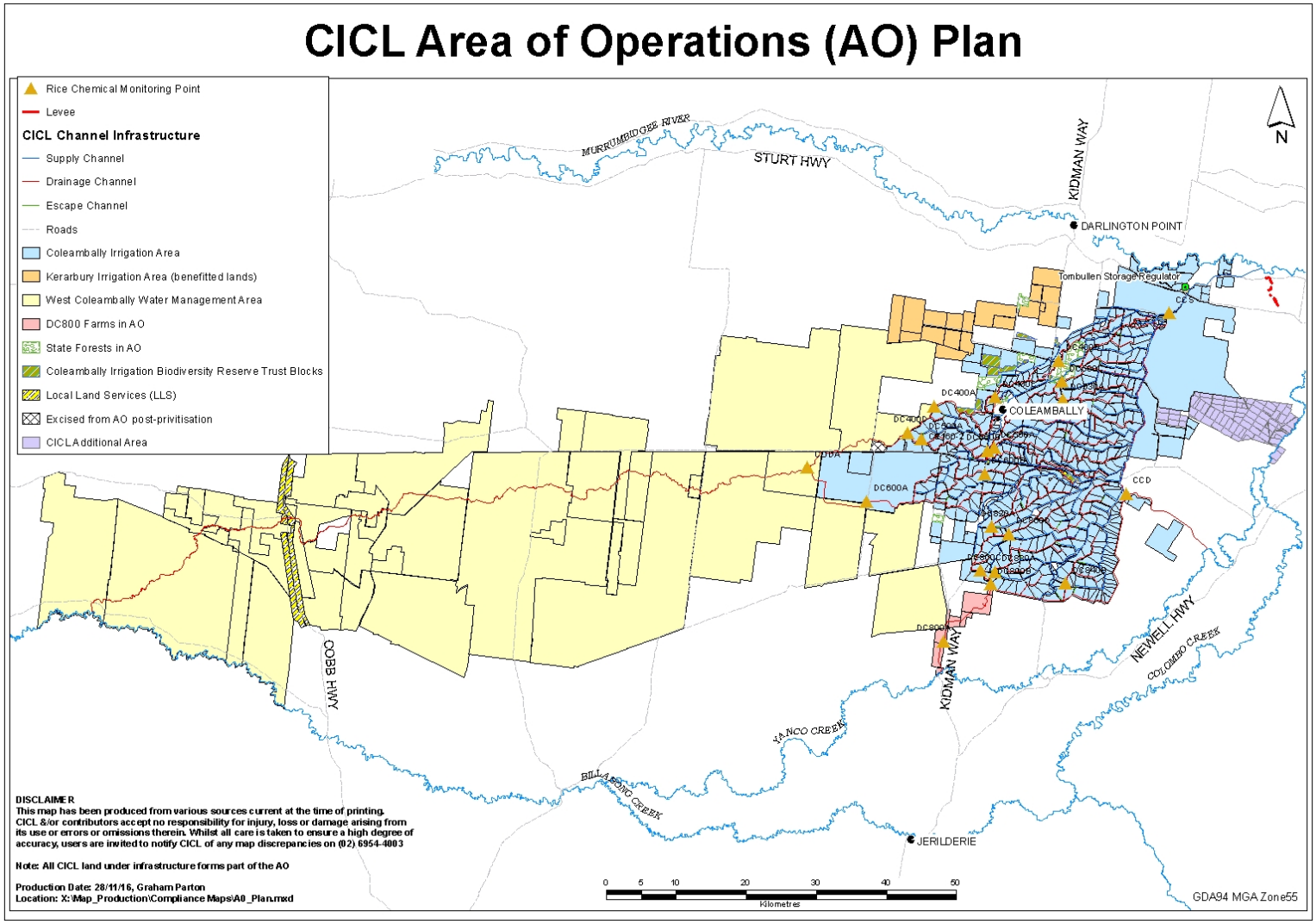
The Coleambally Irrigation Area (CIA) is located south of Griffith between the towns of Darlington Point and Jerilderie, New South Wales in the southern Murray-Darling Basin of Australia –refer to Figure 3.1

Figure 3.1 CIA Location



[1] Known as Annual Environment Report (AER) prior to 2009/10

Figure 3.2 Current Area of Operation of CICL including benefitted lands.[2] (See attached Appendices A7 for higher level of detail)



[2] The term "benefitted lands" is given to land that receives a benefit from our licence and or licenced works but which are not defined as being within the AO.

3.2 Plans of Works and Monitoring Sites

Figure 3.3 shows the location of Approved Works. The Approval 2012 and the ground water work approvals 40CA403808 and 40WA404593 issued by the NSW DPI Water include three water extraction works, namely: Coleambally Main Canal Off-take, Col Bore and Hort Bore. The Approval 2012 also includes three drainage discharge points - CCD on the Coleambally Catchment Drain; DC 800A on Drainage Channel 800; and CODD at Bundy on the West Coleambally Channel. One additional monitoring point has also been approved - CODA, on the West Coleambally Channel. The CODA monitoring point is used in conjunction with CICL's Rice Chemical Monitoring Program in lieu of CODD due to CODA's closer proximity to Coleambally. Figure 3.3 also shows the location of the Kerarbury Channel Off-take Regulator which supplies water to the benefitted lands of the Kerarbury Irrigation District.

A total of 737 piezometers are located across the CIA to monitor ground -water levels in the shallow aquifer (0-12m) and the Shepparton formation (12-60m). Their locations are shown in Figure 3.4.

The following table indicates where data contained in this report derives from. In order to provide the most accurate data possible the source with the highest accuracy is used. All data sources are provided in electronic form if not presented in this report.

Table 3.1 Site Name and Data Source comparison

NSW DPI- Hydrometrics site number	NSW DPI- Water Licenced Site	NSW EPA Licenced Site	ACR Data Source Comment
410110	CODA	1 CODWonga	Salinity from CODA (410110) Flow from CODWonga (Flume)
410133	CODD	4 CODOaklands	Salinity from CODD (410133) Flow from CODOaklands (Flume)
410108	DC800A	2 DC800A	Salinity and Flow from DC800A
410135	CCD	3 CCD	Salinity from CCD (410135) Flow from CCD Escape (Flume)

Figure 3.3 Works Plan

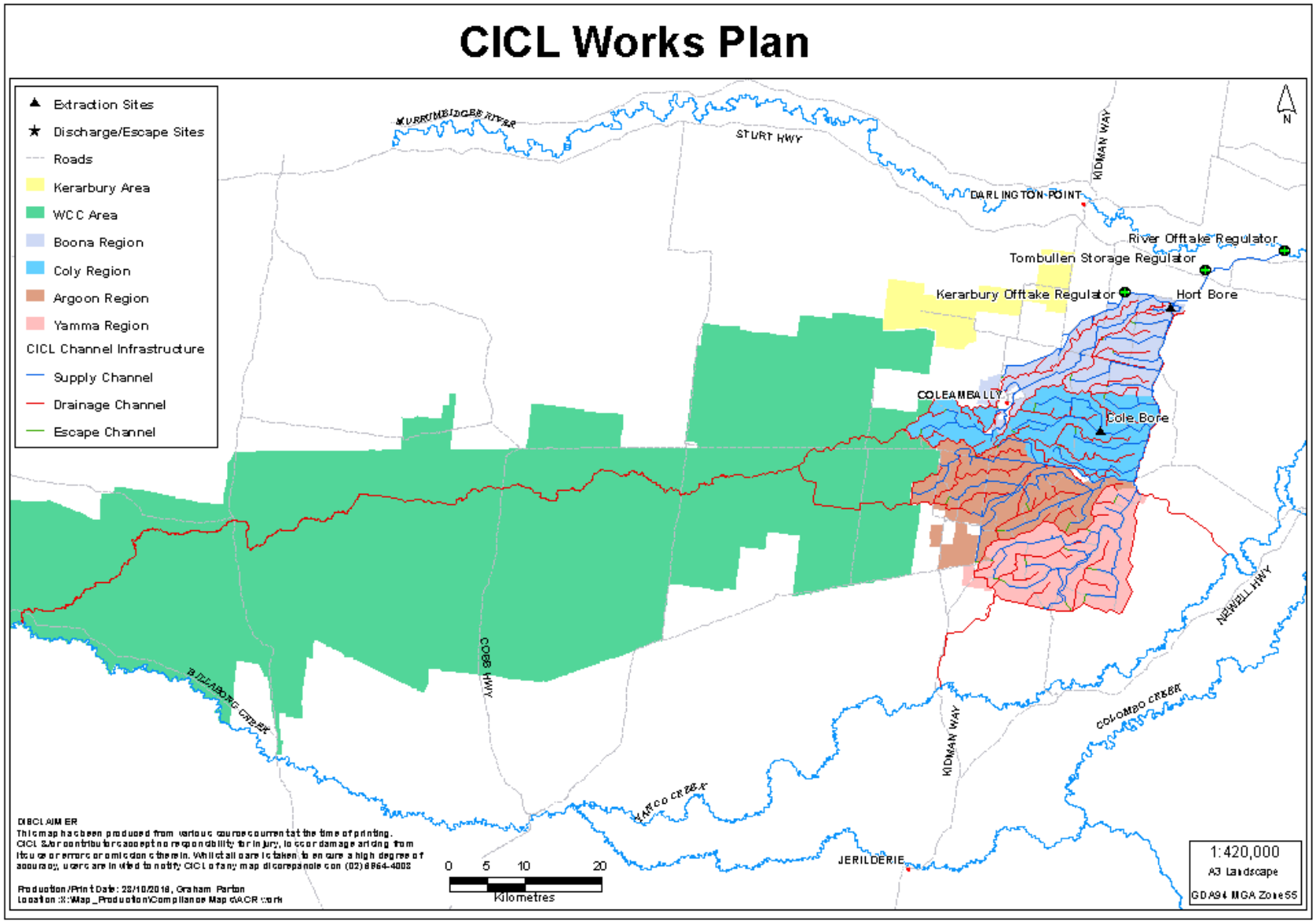
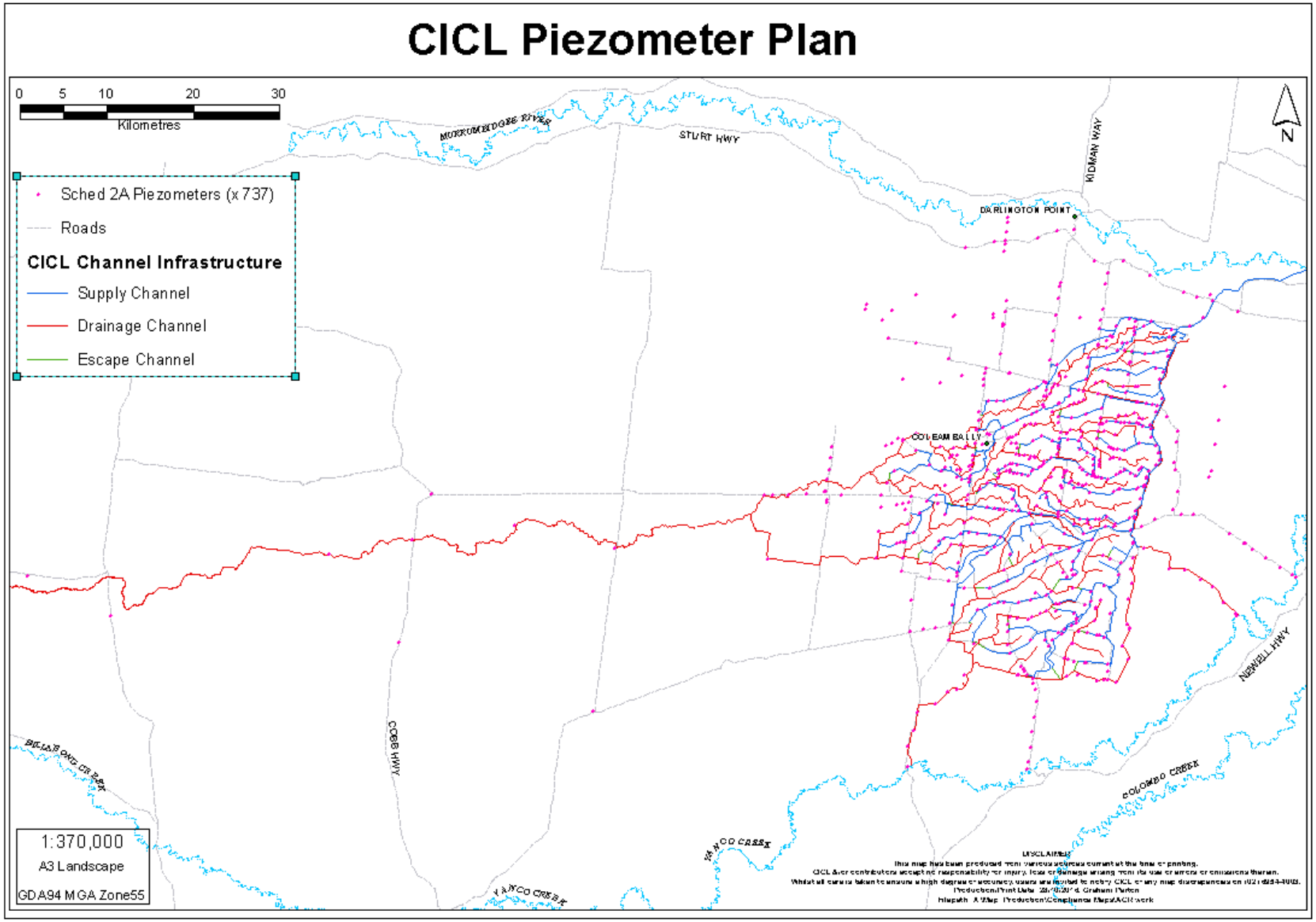


Figure 3.4 Piezometer (Monitoring Sites) Plan



4. Data and Analysis

4.1 Water Allocation

Table 4.1 shows the dates and announced General Security allocations in the Murrumbidgee Valley during 2016/17.

Table 4.1 Cumulative General Security Water Allocations for 2016/17

Date	Cumulative GS Allocation (%)
1/07/2016	20%
15/07/2016	33%
1/08/2016	44%
15/08/2016	50%
1/09/2016	54%
15/09/2016	61%
4/10/2016	61%
17/10/2016	71%
1/11/2016	76%
15/11/2016	100%

Figure 4.1 shows annual general security allocations in the Murrumbidgee Valley since 1982/83.

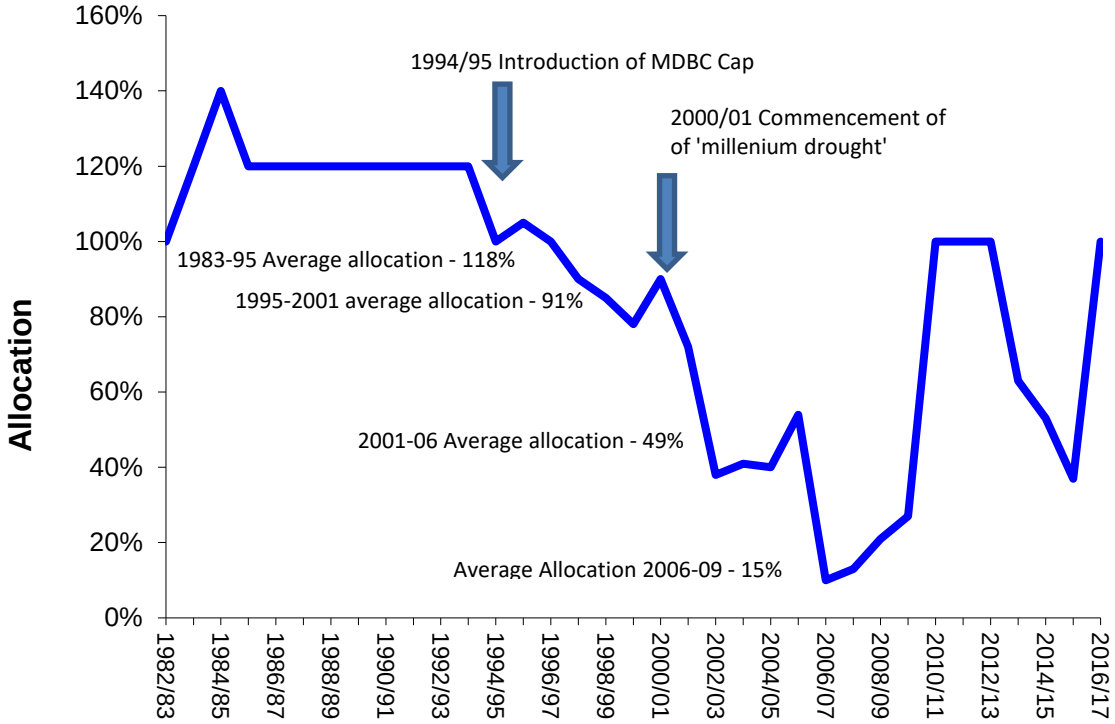


Figure 4.1: Annual allocations for General Security entitlement in the Murrumbidgee Valley since 1982/83

4.2 Monitoring Data

In compliance with Condition 12 of the Approval 2012, the following monitoring data is included:

Monitoring Data provided in Compliance Condition 12,Approval 2012	Reference	Provided
Plan of the Area of Operations	Fig 3.2	✓
Plan showing the current location of works	Fig 3.3	✓
Crop Type, Crop Area and Water Usage data	2.1, 4.15	✓
Piezometer pressure level data	Electronic	✓
Daily Surface Water Extraction and Salinity	Electronic	✓
Daily Drainage, Salinity and Flow Data	Electronic	✓
Monthly Ground Water Extraction from CICL's Approved Works, Salinity and Salt Load	A4	✓
Ground Water Extraction from other Approved Works	Electronic	✓
Daily Drainage Flow and Salinity data from three licensed discharge sites and one licensed monitoring site	Electronic	✓
Monthly Drainage Water quality data for Nutrients	A5	✓
Monthly Drainage Water quality data for Chemicals	A5	✓
Weekly Rice Chemical Monitoring Program results	8.2	✓
Additional Detailed Map		✓

4.3 Trends

Salinity

Tables 4.2 to 4.5 show monthly average salinity readings at three discharge points and one monitoring point. EC data is provided from WaterNSW gauging stations. However to obtain more accurate EC, data without flow from a metered site are omitted and likewise metered flows without salinity are given monthly corrected average EC. In these tables, 2016/17 data is compared with data from the previous two years and with the benchmark data. The benchmark was set up through averaging the data of the three seasons immediately preceding the privatisation of CICL in 2000. In the case of salinity data, NF indicates no flow.

Table 4.2: MONTHLY SALINITY READINGS AT DISCHARGE POINT CCD Flume on the Coleambally Catchment Drain (µS/cm)

Month	2016/2017	2015/2016	2014/2015	Benchmark
July	NF	NF	148	120
August	NF	176	153	164
September	260	190	NF	213
October	333	286	NF	143
November	371	228	NF	98
December	214	135	99	96
January	328	219	139	128
February	166	143	194	16
March	133	217	168	64
April	231	194	103	94
May	197	192	90	106
June	305	145	70	158
Average	**254**	**193**	**129**	**117**
Median	**246**	**192**	**139**	**113**

The salinity at CCD appears to be higher than the benchmark, however after investigation by CICL the benchmark was found to be inaccurate with no flow (NF) EC data being included in averages.

Table 4.3: MONTHLY AVERAGE SALINITY READINGS AT LICENSED DISCHARGE POINT DC800A (410108) on the Drainage Channel DC800 (µS/cm)

Month	2016/2017	2015/2016	2014/2015	Benchmark
July	228	151	411	1,496
August	243	168	166	1,661
September	214	202	167	338
October	247	351	128	257
November	351	261	117	314
December	345	122	140	306
January	332	138	189	268
February	252	153	297	240
March	178	190	180	268
April	228	162	135	215
May	258	168	135	226
June	261	145	168	534
Average	**261**	**184**	**186**	**510**
Median	**249**	**165**	**167**	**287**

Table 4.4: MONTHLY SALINITY READINGS AT MONITORING POINT CODWonga on the West Coleambally Channel (µS/cm)

Month	2016/17	2015/16	2014/2015	Benchmark
July	445	168	NF	1,359
August	475	190	407	1,504
September	327	201	174	886
October	246	369	139	399
November	246	211	95	524
December	240	179	109	526
January	198	158	201	457
February	152	168	260	437
March	269	151	151	367
April	238	190	115	459
May	252	221	152	487
June	284	244	195	1,133
Average	**281**	**204**	**182**	**712**
Median	**249**	**190**	**152**	**506**

Table 4.5: MONTHLY SALINITY READINGS AT DISCHARGE POINT CODOaklands at BUNDY on the West Coleambally Channel (µS/cm)

Month	2016/2017	2015/2016	2014/2015	Benchmark
July	275	227	NF	1,868
August	275	NF	NF	1,829
September	275	NF	NF	536
October	275	NF	256	415
November	434	227	256	450
December	524	227	NF	531
January	502	NF	256	416
February	502	NF	NF	409
March	502	227	256	374
April	238	227	186	362
May	273	NF	196	330
June	267	227	NF	406
Average	**362**	**227**	**234**	**660**
Median	**275**	**227**	**256**	**415**

The above data shows that the monthly average salinity in the last three years at CODA DC800A and CODD has remained relatively low in comparison to the benchmark years.

While salinity levels in CIA drains have decreased from benchmark figures, this year saw a slight increase in salinity of all drains above prior year.

Flow

Tables 4.6 to 4.9 show monthly average drainage flows at three discharge points and one monitoring point. Again 2016/17 data is compared with the previous two years' data and with benchmark data. The benchmark was established through averaging the data from the three seasons immediately preceding privatisation of CICL in 2000.

It should be noted that some of the gauged flow data obtained may not be entirely accurate due to high water events on the Yanco and Billabong Creeks, which potential results in backwater from the creek levels impacting CCD Gauge (410191) and CODD (410133). In addition to backwater impacts from high flow in the Yanco, weed growth and backwater from downstream structures may impact the accuracy of the stage-discharge rating curves particularly at DC800 (410108) and DC500 (410110). These sites are owned and operated by WaterNSW. Where possible therefore CICL uses the more accurate metered flume figures for flow.

Table 4.6: MONTHLY FLOW READINGS (ML) AT CCD escape on the Coleambally Catchment Drain (substituted for CCD (410191))

Month	2016/2017	2015/2016	2014/2015	2013/2014	Benchmark
July	0	0	100	11	21
August	0	5,710	1	36	290
September	100	587	0	1,526	887
October	419	2,333	0	1,213	1,853
November	0	782	0	626	2,073
December	2,433	3,102	80	1,403	2,305
January	2,852	2,952	214	3,222	3,619
February	4,155	2,101	346	3,155	1,843
March	7,564	4,856	2,923	2,853	2,112
April	784	2,752	1,194	30	1,756
May	699	70	1	0	1,430
June	70	86	252	0	279
Total	**19,076**	**25,331**	**5,112**	**14,075**	**18,468**
Average	**1,590**	**2,111**	**426**	**1,173**	**1,539**
Median	559	2,217	214	919	1,800

(NOTE CCD is used to delivery water into Yanco Creek for Water NSW)

Table 4.7: MONTHLY FLOW READINGS (ML) AT LICENSED DISCHARGE POINT DC800A (410108) on the Drainage Channel DC800

Month	2016/2017	2015/2016	2014/2015	Benchmark
July	295	105	1	432
August	102	192	166	1,197
September	365	475	1,073	4,455
October	23	770	1,986	5,962
November	211	315	814	5,119
December	621	984	718	5,162
January	233	1,463	627	7,660
February	897	945	516	6,795
March	2,589	2,333	1,321	7,816
April	909	579	255	3,721
May	355	317	282	2,961
June	1,269	2,652	1,305	1,675
Total	**7,869**	**11,128**	**9,064**	**52,955**
Average	**656**	**927**	**755**	**4,413**
Median	360	674	673	4,787

(Note: DC800 is used to deliver water into Yanco Creek for WaterNSW)

Table 4.8: MONTHLY FLOW READINGS (ML) CODWonga on the West Coleambally Channel substituted for CODA (410110)

Month	2016/2017	2015/2016	2014/2015	Benchmark
July	694	116	0	619
August	254	471	51	739
September	1,994	1,095	181	4,983
October	2,102	558	1,631	4,494
November	1,133	1,142	897	5,014
December	49	1,426	987	4,041
January	1,104	741	1,265	6,806
February	1,941	742	710	5,540
March	4,406	2,557	2,497	8,438
April	2,216	3,652	1,699	4,427
May	1,333	268	171	4,209
June	2,565	3,982	3,488	2,183
Total	**19,792**	**16,749**	**13,576**	**51,493**
Average	**1,649**	**1,396**	**1,131**	**4,291**
Median	1,637	918	987	4,460

Table 4.9: MONTHLY FLOW READINGS (ML) CODOaklands on the West Coleambally Channel substituted for CODD at Bundy

Month	2016/2017	2015/2016	2014/2015	Benchmark
July	71	3	8	282
August	56	0	0	2,150
September	490	0	0	3,327
October	1,195	0	0	1,914
November	89	4	0	3,187
December	130	147	0	1,536
January	58	0	0	3,523
February	64	0	0	4,461
March	6	181	0	3,517
April	167	8	41	1,814
May	45	0	0	2,511
June	20	247	0	3,053
Total	**2,390**	**590**	**49**	**31,275**
Average	**199**	**49**	**4**	**2,606**
Median	67	1	25	2,782

Table 4.10 shows the monthly total amounts of water supplied through the Boona and Argoon escapes which supply planned released water supplied through CODA and CODW and is reported in accordance with the requirements of section M2.5 of EPL 4652.

Table 4.10: Monthly Flow (ML) at Boona and Argoon Escapes 2016/17

Month	Boona	Argoon
July	4	1
August	0	0
September	29	115
October	0	877
November	194	716
December	137	1,542
January	0	1,274
February	0	1,890
March	0	2,889
April	0	1,348
May	0	1,277
June	276	1,397
Total	**640**	**13,326**

Extraction

Table 4.11 shows monthly average extraction at the Coleambally Main Canal Off-take. For all three extraction points 2016/17 data is compared with the previous two seasons' data and with benchmark data. The CCS benchmark was established through averaging the data of three seasons immediately preceding the privatisation of CICL in 2000.

Table 4.11: MONTHLY EXTRACTIONS (ML) AT LICENCE POINT CCS (Main Canal Off-take)

Month	2016/2017	2015/2016	2014/2015	Benchmark
July	0	9,702	0	0
August	1,658	21,519	3,00	0
September	10,384	28,766	31,988	42,294
October	17,485	46,097	68,385	38,311
November	51,219	23,409	55,235	57,310
December	72,930	52,397	20,480	66,774
January	92,801	47,695	71,120	95,277
February	74,157	35,315	48,830	61,406
March	61,006	27,313	26,930	105,786
April	23,496	16,132	18,305	54,865
May	12,608	1,467	4,475	33,506
June	0	0	0	0
Total	**417,743**	**309,812**	**348,948**	**555,533**
Average	**34,812**	**25,818**	**29,079**	**46,294**
Median	20,491	25,361	23,705	48,580

Tables 4.12 to 4.13 show monthly average extractions from both Col Bore and Hort Bore the benchmark is derived from first operational season.

Table 4.12: MONTHLY EXTRACTIONS (ML) COL BORE

Month	2016/2017	2015/2016	2014/2015	Benchmark 2007/08
July	0	0	0	0
August	0	0	0	184
September	0	0	0	459
October	0	0	29	376
November	340	2	0	180
December	425	481	166	228
January	626	364	0	317
February	626	363	0	218
March	448	476	0	302
April	250	0	0	339
May	0	0	0	209
June	0	95	0	0
Total	**2,715**	**1,781**	**195**	**2,812**

Table 4.13: MONTHLY EXTRACTIONS (ML) HORT BORE

Month	2016/17	2015/2016	2014/2015	Benchmark 2008/09
July	0	0	0	0
August	0	10	50	0
September	0	0	31	0
October	0	62	9	559
November	0	0	152	120
December	0	0	0	1
January	326	0	551	0
February	325	0	156	0
March	288	0	92	744
April	322	0	4	404
May	478	0	0	0
June	54	1	0	0
Total	**1,793**	**73**	**1,045**	**1,828**

Hort Bore is primarily used to supply high security water on demand outside of the normal CICL irrigation supply period.

Groundwater bore usage is largely influenced by the value of temporary surface water relative to pumping costs.

Crop Water Use

Table 4.14 shows the crops grown by area within the CID, the quantity of irrigation water supplied by CICL, average crop water usage and the proportion of water supplied to each crop as a percentage of total water supplied by CICL.

Table 4.14: 2016-2017 Crop Area, Total Crop Use, Crop Water Use and Proportion of Total Deliveries

Crop	Area (Ha)	Intensity (ML/Ha)	Total ML	% Total Use
Rice	11,484	15.14	173,843	53.6%
Wheat	8,462	1.35	11,450	3.5%
Corn	5,105	8.55	43,654	13.5%
Cotton	6,623	8.77	58,060	17.9%
Pasture	10,679	1.23	13,145	4.1%
Barley	1,883	1.90	3,586	1.1%
Soybeans	892	6.74	6,008	1.9%
Canola	1,512	2.56	3,869	1.2%
Oats	510	1.67	854	0.3%
Other	952	n/a	8,873	3.1%
TOTAL	**48,102**		**323,341**	**100.0%**

The above data was supplied by CICL's Customers at the beginning of the irrigation season and is then ground truthed by various means, however it serves only as an approximation of the area actually irrigated and the irrigation intensity.

Table 4.15 on the following page indicates the change in area of seven major crops in the CID over the last 19 years. Rice continues to be the dominant crop grown within the district. CICL expects that the cropping mix will continue to respond to three major drivers: commodity prices (grower returns); the timing and quantum of water allocations and the availability and price of temporary water.

Table 4.15: Crop Areas and Relative Water Usage over Time

Season	Rice		Corn/Maize		Soybeans		Cotton		Wheat		Pasture		Canola		
	Area (ha)	Proportion of delivery (%)	Area (ha)	Proportion of delivery (%)	Area (ha)	Proportion of delivery (%)	Area (ha)	Proportion of delivery (%)	Area (ha)	Proportion of delivery (%)	Area (ha)	Proportion of delivery (%)	Area (ha)	Proportion of delivery (%)	Total (%)
2016/17	11,484	53.6	5105	13.5	892	1.9	6623	17.9	8462	3.5	10679	4.1	1512	1.2	95.7
2015/16	3,603	34.6	8462	13.5	1883	3	5105	20.6	11484	14.8	6623	7.00	892	0.1	94
2014/15	9,103	44	6757	13	1666	2	2602	7	14226	18	4737	4	1716	1	91
2013/14	12,500	43.6	4358	8.4	1734	2.4	5587	6.9	15071	9.8	5264	2.8	2540	1.5	75.4
2012/13	19,071	52.7	4872	7.7	2583	3.9	2089	3	13698	7.2	6545	3.6	4182	1.3	79.4
2011/12	16,745	62.1	4767	8.2	2238	2.7	5280	7.9	15989	8.7	7472	4	5244	1.6	91.2
2010/11	14,512	68.3	4367	7.2	1240	1.5	885	1.4	11334	5.1	8119	4.2	3381	1.5	89.2
2009/10	3,668	46	311	2	495	1	0	0	10635	10	6903	12	2523	2	73
2008/09	2,135	33.1	2472	3.4	308	1.4	0	0	4215	9.5	4481	16.3	1471	4.9	68.7
2007/08	90	1.4	941	1.2	152	0.7	0	0	6575	20	5004	20	1584	6.1	49.4
2006/07	8,518	54.3	1863	7.6	478	0.8	0	0	12509	15.9	9958	7.8	1602	1	87.4
2005/06	18,025	62.8	3306	7	2106	2.9	0	0	13610	8.4	15440	8.7	1748	0.9	90.6
2004/05	8,142	44	3671	7.2	1495	2.2	0	0	20287	18.8	12865	10.8	2681	1.3	84.3
2003/04	12,597	55.8	3545	5.7	1938	3.5	0	0	21192	15	12131	7.5	1763	0.7	88
2002/03	11,395	46	4788	9.3	1788	1	0	0	21346	20.4	10183	7.4	2095	1.7	85.8
2001/02	27,493	67.5	3808	4.2	3297	3.4	0	0	21103	9.2	11581	6.1	2191	0.6	91
2000/01	30,440	73.9	4074	5.7	4551	5.9	0	0	14276	4.6	11998	4.7	2153	0.4	95.2
1999/00	24,138	77.7	1178	3.1	2185	3.9	0	0	12649	6.1	7485	4.4	2152	0.7	95.9
1998/99	24,491	73.8	1059	1.3	4339	5.7	0	0	13963	1.7	13879	8.1	2184	1.7	92.3
1997/98	24,624	70.4	1059	1.3	4998	7.5	0	0	14943	7.4	9964	6.1	2053	0.4	94.2

4.4 Data Omissions and Discrepancies

This section identifies the variations, discrepancies and data omissions and details of any action undertaken or proposed to remedy any monitoring and/or reporting deficiencies in satisfying condition 12.4 of the approval 2012.

Salinity data was deleted from all sites during periods where no flow was detected and where flow was present with no salinity the monthly average was used. To achieve improved flow accuracy, CICL has chosen to substitute flow figures for CODA (410110) from the Wonga Rubicon Flume regulator because the installation of this regulator has rendered the CODA gauging less accurate (backwater effects). The flow data from the CICL regulator at COD Oaklands (CODO) has been substituted for the WaterNSW Gauge CODD at Bundy 410133. Apart from backwater effects, the Flumegate regulator has a higher level of accuracy than a standard stage-discharge rating in this stream situation.

CCD is a supply point for WaterNSW customers and these flows are measured at the CICL delivery point – not at the WaterNSW Gauge (410191). As with the CODA site, the flow data from CICL CCD delivery system is used in conjunction with the continuous EC data from the WaterNSW gauge to compute salt load. The WaterNSW CCD gauge is, during period of high flow in the Yanco, impacted by backwater from the Yanco creek and considered unreliable. The following table indicates where data is sourced.

NSW DPI-Hydrometrics site number	NSW DPI-Water Licenced Site	NSW EPA Licenced Site	ACR Comment
410110	CODA	1 CODWonga	Salinity from CODA (410110) Flow from CODWonga (Flume)
410133	CODD	4 CODOaklands	Salinity from CODD (410133) Flow from CODOaklands (Flume)
410108	DC800A	2 DC800A	Salinity and Flow from DC800A
410135	CCD	3 CCD	Salinity from CCD (410135) Flow from CCD Escape (Flume)

Only 94% of the 737 piezometers were read. Approximately 6% of the piezometers were unserviceable due to physical damage or integrity of the piezometer. There were approximately 10 outlier readings (typographical or observation error) that were discarded. Individual piezometer readings have not been included in the 2016/17 ACR. Summary piezometer data can be provided as an excel file.

In previous ACRs total groundwater usage within the CICL area of operations has been reported. However this data is now owned and managed by WaterNSW and not accessible to CICL.

Monitoring and Testing Data

An electronic copy of of all daily and monthly monitoring and testing data required under Section 12.7 of the Combined Licence Package is forwarded by email to relevant authorities.

4.5 Quality Assurance and Control Standards

The following section lists various parameters monitored in compliance with the licence conditions and explains the methodology used for data collection and analysis, and for the calibration of measuring devices.

Flow Monitoring

Coleambally Main Canal Off-take

Surface water extraction by CICL is measured at the point of take from the Murrumbidgee River into CICL's Main Canal using an Accusonic transit-time meter with four individual velocity paths. The meter is independently checked by Certified Practicing Hydrographers on a monthly basis and subjected to in-house inspection on a weekly basis. The results of this verification process is shown in Appendix 6.

Irrigators' Water Supply Points

There are 738 water supply points within CICL's Area of Operations - 537 of these are FlumeGates and two are Slip-Gates (with both gates produced by Rubicon Water Australia); 24 are AgriFlo Doppler flow meters (MACE products); 47 are propeller meters on Horticulture pump outlets and 128 are Stock and Garden meters (small diameter propeller meters).

Verification of customer supply meters is undertaken twice a year by appropriately qualified CICL staff (Certified Meter Validators). A sample of these customer outlets are also verified on an annual basis by an independent meter validator.

Col Bore and Hort Bore

In addition to its take of surface water, CICL extracts water ground water from its deep water bores – the Col Bore and Hort Bore. WaterNSW owned Magflow meters are installed at both bores.

4.6 Salinity and Salt Load

Salinity at Water Extraction Works

CICL has continuous monitoring of EC at its Main Canal Off-take. This information is reported back through the SCADA system.

Salinity at Licensed Discharge Points

CICL uses Electrical Conductivity (EC) data collected by WaterNSW at three licensed discharge points and one licensed monitoring point. These sites continuously monitor flow and EC.

Salt Load Calculation

The Salt Load has been calculated by using the following formula, which assumes that 1 ML @ 1000µg/L contains 640 kg of salt:

(EC/1000 x 0.64) x ML

4.7 Pesticides in Supply and Drainage Water

In accordance with the EPL, CICL monitors the range of pesticides and nutrients as specified by the EPL in both supply and drainage water. Details of results obtained are contained at Appendices A1 and Section 8.4.

4.8 Turbidity and pH

CICL monitor these parameters in both supply and drainage water using hand-held meters. These meters are calibrated by CICL staff.

4.9 Crop Type and Crop Area

This information is collected from landholders using summer and winter crop type/area forms.

4.10 Crop Water Usage

Crop water usage information is calculated based on actual water orders and crop information provided by landholders prior to the commencement of the irrigation season and as such is an approximation of the actual final area planted. The amount of water diverted onto individual farms is however measured very precisely.

4.11 Groundwater Levels and Groundwater Salinity

These parameters are measured by appropriately trained CICL staff. The methodology for groundwater levels and groundwater salinity monitoring was developed in conjunction with NSW DPI Water.

5. Water Management

Table 5.1 is intended to satisfy the conditions in 12.10 of the Approval 2012. It must be noted however that the data provided reflects an irrigation season which runs from September to June. Tables 5.1 and 5.2 display reconciled monthly volumes of water:

- taken through each authorised water supply work against the Approval Holder's water access licences;
- taken through each authorised water supply work against other water access licences; and
- released from each escape as an authorised credit.

Table 5.1: 2016/17 Water (ML) taken through Water Supply Works against Water Access Licences (with readings taken mid-month)

Surface Water Licences (Works Approval 40CA401473)	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
Landholder High Security Access Licence 40AL401469	0	0	0	0	0	0	2,913	0	0	0	0	0	2,913
Converted High Security 40AL405230	0	0	0	0	0	0	5,735	0	0	0	0	0	5,735
2nd Converted High Security 40AL405343	0	0	0	0	0	0	594	0	0	0	0	0	594
General Security Access Licence 40 AL401471	0	0	0	0	0	0	11,524	75,555	55,716	21,358	4,484	0	168,638
General Security Access Licence 40 AL405267	0	0	0	0	0	0	4,678	0	0	0	0	0	4,678
Town Water Supply High Security Access Licence 40AL401470	0	0	0	0	0	0	70	0	0	0	0	0	70
Outfall Drain High Security S & T Access Licence 40AL401472	0	0	0	0	0	0	3,227	0	0	0	0	0	3,227
Conveyance Loss Allowance Access Licence 40AL402990	0	0	0	0	28,965	41,347	47,060	0	0	0	0	0	117,371
Supplementary Access Licence 40AL402991	0	0	9,901	2,141	9,754	0	0	0	0	0	0	0	21,796
Total	**0**	**0**	**9,901**	**2,141**	**38,718**	**41,347**	**75,801**	**75,555**	**55,716**	**21,358**	**4,484**	**0**	**325,021**
Aquifer Access Licence 40AL403806 & Supplementary 40AL403807													
Col Bore (Works Approval 40CA403808)	0	0	0	0	340	425	626	626	448	250	0	0	2,715
Hort Bore (Works Approval 40WA404593)	0	0	0	0	0	0	326	326	288	322	478	54	1,794
Combined Total	**0**	**0**	**9,901**	**2,141**	**39,058**	**41,772**	**76,753**	**76,507**	**56,452**	**21,930**	**4,962**	**54**	**329,530**

The following information is provided to satisfy condition 12.11 of the approval 2012.

Table 5.2: 2016/17 Volumes (ML) Released without Credit, Released from Drain, and Released to Customers

2016/17	Released without credit from escapes	ML Released from Drains	Delivered to CICL Customers
Jul	0	0	0
Aug	0	0	0
Sep	0	0	1,864
Oct	0	0	3,340
Nov	0	0	37,735
Dec	0	0	40,031
Jan	0	0	75,212
Feb	0	0	75,212
Mar	0	0	55,580
Apr	0	0	21,375
May	0	0	9,332
Jun	0	0	3,660
Total	**0**	**0**	**323,341**

There were no releases from drains but for purpose of suppling customers during the 2016/17 season.

5.1 Estimated Annual Volumes

The following information is provided to satisfy condition 12.12 of the Approval 2012.

Table 5.3 indicates the estimated annual volumes of net channel losses, including deliveries, escapes, recycling, evaporation, rainfall, change in storage and seepage.

The channel losses through escape channels, evaporation, change in storage, seepage and gains in the channel system through rainfall, are shown in Table 5.3. The gains from rainfall and losses through evaporation have been calculated for the 2016/17 irrigation season only.

For the purpose of calculating evaporation in Table 5.3, the channel surface area has been estimated as 555 ha.

Table 5.3: Net Channel Loss Accounting

Losses	Estimated volume (ML)
Escapes	0
Evaporation	-8,414
Change in storage	0
Seepage	-7,115
Total Losses	**-15,529**
Rainfall	3,629
Net Channel Losses	**-11,900 ML**

5.2 Water Balance for the entire Area of Operations

This CICL system water balance is outlined in Table 5.3 and Table 5.4. This information is presented to satisfy conditions 12.10, 12.11 and 12.12

Table 5.4: Water Use (ML) – 2016/17

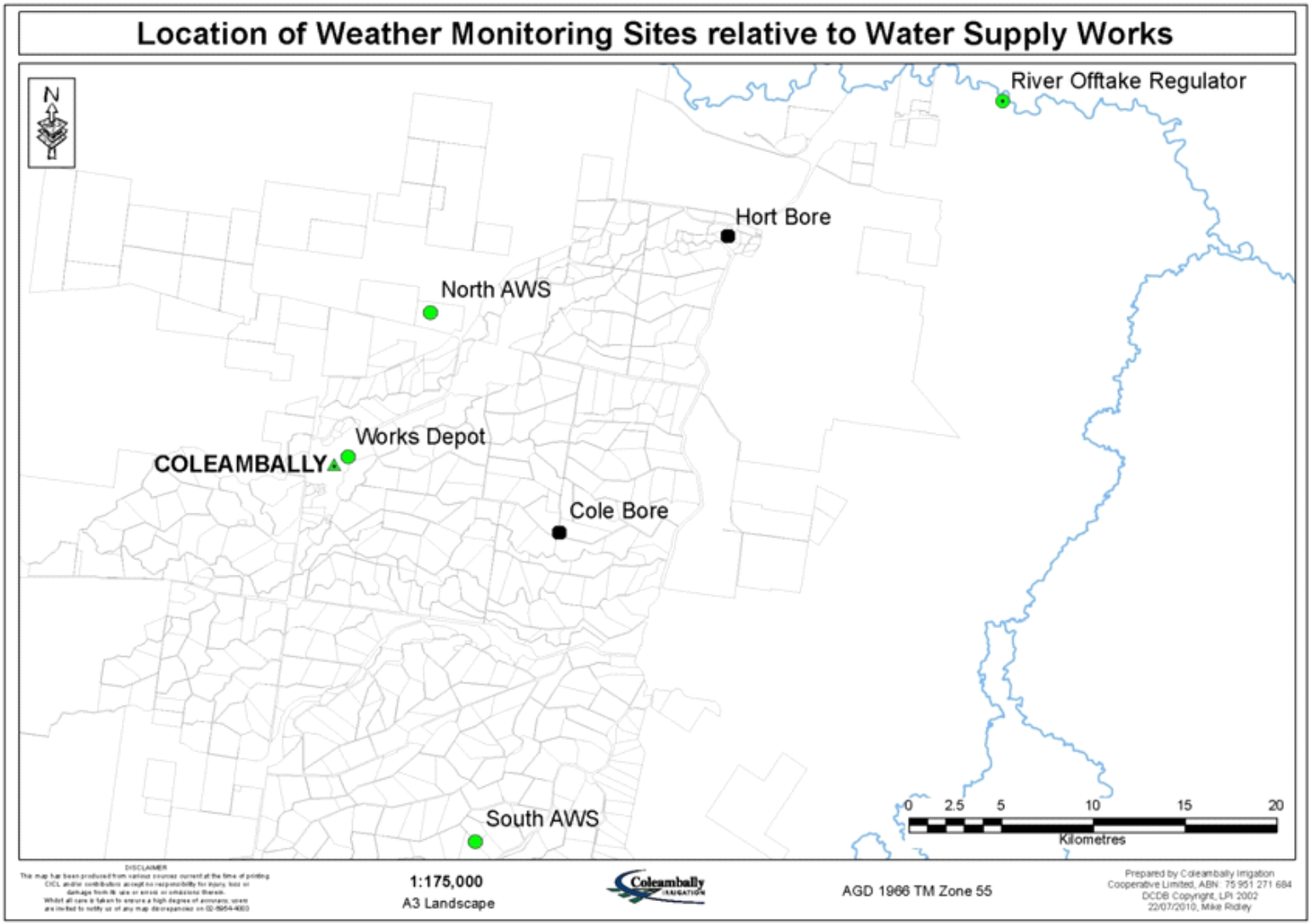
Bulk Accounts	***Debit***	***Credit***
Carryover 15/16		0
Allocation		490,275
Supplementary		19,043
Net Transfers	13,781	
Groundwater		4,509
River Diversion	417,743	
Bore Pumping	4,509	
WaterNSW/OEH Credits		92,722
AS AT 30 JUNE 2017	**436,033**	**606,549**
Unused	170,516	
Carryover 17/18 (maximum)	153,397	
Remainder above Carryover limit		17,119

CICL Accounts	***Debit***	***Credit***
Resources available		
Net Diversions		329,530
Delivered to Customers	323,341	
Transmission Credits		5,711
AS AT 30 JUNE 2017	**323,341**	**335,241**
Net Channel Losses	11,900	

5.3 Estimated Annual Rainfall at each Water Supply Work

A map depicting the locations of weather monitoring sites relative to all water supply works is shown in Figure 5.2 below.

Figure 5.1: Location of Weather Monitoring Sites relative to Water Supply Works. (AWS = Automatic Weather Station)



5.4 Estimated Annual Evapo-transpiration / Rainfall at each Water Supply Work

South Automatic Weather Station (AWS/2) records both rainfall and reference evapo-transpiration (ET_o). For the reporting period annual rainfall and evaporation was recorded as 461.4mm and 1445.7mm respectively. Deopt weather data can be found in electronic attachements.

Table 5.5: Rainfall and Evaporation AWS/2 – 2016/17

AWS/2 (South AWS)	Rain (mm)	ETo (mm)
July	55	33.5
Aug	34.2	49.2
Sept	119	61.6
Oct	23.6	115
Nov	32.4	178.6
Dec	36	206.9
Jan	7.6	235.8
Feb	3.4	190.9
Mar	79.8	170.2
Apr	36.4	95.6
May	32.2	54.2
Jun	1.8	54.2
2016/17 TOTAL	**461.4**	**1,445.7**

6. Salinity and Salt Load

Table 6.1 is provided in satisfaction of requirement 12.14 of approval 2012.

Table 6.1: Volume of Water Entering CICL's Operational Area (ML), Salinity (µS/cm) and Salt Load (Tonnes) in 2016/17

Month	MAIN CANAL			COL BORE			HORT BORE		
	ML	µS/cm	Salt (T)	ML	µS/cm	Salt (T)	ML	µS/cm	Salt (T)
July	0	187	0	0	0	0	0	0	0
August	1,658	207	236	0	0	0	0	0	0
September	10,384	200	1,386	0	0	0	0	0	0
October	17,485	218	2,544	0	0	0	0	0	0
November	51,219	203	6,769	340	610	133	0	0	0
December	72,930	200	9,291	425	610	166	0	0	0
January	92,801	153	9,067	626	610	244	326	280	58
February	74,157	119	5,694	626	610	244	325	280	58
March	61,006	119	4,484	448	610	175	288	280	52
April	23,496	149	2,208	250	610	98	322	280	58
May	12,608	156	1,246	0	0	0	478	280	86
June	0	192	0	0	0	0	54	280	10
Total	**417,743**		**42,926**	**2,715**		**1,060**	**1,793**		**321**
Salt TOTAL	**44,307**								
ML TOTAL	**422,251**								

Tables 6.2 to 6.4 are provided to satisfy requirement 12.15 of approval 2012.

Table 6.2: Volume of Water exiting CICL's Operational Area (ML), Salinity (µS/cm) and Salt Load (Tonnes) in 2016/17

Month	DC 800@ OUTFALL			Salt Load @ DC 500 at Wonga			Salt Load @ CCD Escape			Salt Load @ Tombullen Storage		
	ML	µS/cm	Salt (T)	ML	µS/cm	Salt (T)	ML	µS/cm	Salt (T)	ML	µS/cm	Salt (T)
July	295	228	40	694	445	165	0	NF	0	0	0	0
August	102	243	16	254	475	79	0	NF	0	0	221	0
September	2,527	214	350	1,994	327	386	100	260	18	0	206	0
October	905	247	125	2,102	246	344	419	333	90	3,944	227	573
November	211	351	47	1,133	246	173	0	NF	0	6,624	203	860
December	621	345	107	49	240	262	2,433	214	324	13,268	200	1,701
January	233	332	41	1,104	198	262	2,852	328	594	7,877	153	770
February	897	252	129	1,941	152	122	4,155	166	435	7,040	119	535
March	2,589	178	291	4,406	269	852	7,564	133	634	11,589	119	881
April	909	228	127	2,216	238	342	784	231	107	9,182	149	873
May	355	258	58	1,333	252	213	699	197	104	4,900	154	484
June	1,269	261	194	2,565	284	459	70	305	12	0	0	0
Total	**10,913**		**1,525**	**19,792**		**3,659**	**19,076**		**2,318**	**64,423**		**6,678**
Salt TOTAL	**14,179**											
ML TOTAL	**114,203**											

Table 6.3: Volume of Water exiting CICL's Operational Area at CODO, Salinity (µS/cm) and Salt Load (Tonnes) in 2016/17

Month	Salt Load @ COD Oaklands		
	ML	µS/cm	Salt (T)
July	71	275	12
August	56	275	10
September	490	275	86
October	1,195	275	210
November	89	434	23
December	130	524	42
January	58	502	19
February	64	502	21
March	6	502	2
April	167	238	25
May	45	273	6
June	20	267	4
Total	**2,390**		**460**

Table 6.4 represents a **Simple Annual Salt Balance** comprising the imported, exported and retained Salt Load for the area associated with each separate water supply work. This satisfies requirement 12.16 in the approval 2012.

Table 6.4: CIA Simple Salt Balance (Tonnes) in 2016/17

IMPORTED SALT	Tonnes	EXPORTED SALT	Tonnes
Main Canal	42,926	DC800A	1,525
Col Bore	1,060	CODO	460
Hort Bore	321	CCD	2,318
		Tombullen	6,678
TOTAL	**44,307**		**10,981**
Balance	**33,326**		

For this report, a conversion factor of 1,000 µS/cm in 1 ML = 640 kg of salt has been used. In effect, 1 megalitre of water at an EC of 1000 µS/cm contains 640 kg of salt. This is equivalent to the calculation in Section 4.6.

7. Groundwater Conditions

7.1 Groundwater conditions within the Area of Operations

CICL has a network of piezometers throughout its Area of Operations which is used to monitor ground water conditions. The licence requires that piezometers be read in August (+/- 2 weeks), and it is CICL's practice to read them again in March in order to have a more complete understanding of groundwater conditions. The related data is analysed using Arc Map GIS and MS Excel software.

In March and September 2017, 692 of CICL's 737 licensed piezometers were read. Of those read, 33 were recorded as being dry, and a further 15 as damaged. There were also 10 outlier readings that were disgarded as typographical or observational error.

Piezometers are read to an accuracy of +/- 5cm with the data obtained presented as per the Licence monitoring requirements. Data analysis and mapping is based on a split set of data being, pressure levels from the upper Shepparton aquifer via piezometers < 12m deep, and pressure levels from the lower Shepparton aquifer via piezometers 12m - 60m deep.

Readings from the upper Shepparton aquifer represent the water table, while readings from the lower Shepparton aquifer represent the pieziometric level of the lower confined aquifer.

All piezometers with a recorded depth are mapped, except those recorded as dry/blocked and all those recorded as buried/damaged.

For comparative purposes, ground water levels in the previous year and in the baseline year of 1998 are presented along with the current year. The inclusion of the previous year highlights the change in conditions from the last season to the present, whilst the inclusion of the baseline year allows a comparison with ground water conditions in 1998.

Figures 7.1 and 7.2 are contour maps of the piezometric levels below natural surface for September 2017. A 3D surface of piezometric levels was created from point measurements (depth to water below natural surface at each piezometer) by using the inverse distance weighted (IDW) method of interpolation. This method requires inputs of XY locational coordinates and a Z coordinate for the piezometric level.

Tables 7.1 and 7.2 are tabular representations of Figures 7.1 and 7.2 respectively.

Table 7.1: Ground water depth below natural surface; 0-12m piezometers; Sept 2017 Comparison of areas 2016 – 17, & 1998 – 2017

Groundwater Depth Range Below Natural Surface (m)	Years and Area of Groundwater Depth (ha)			Change in Area of Groundwater Depth (ha) [+ = rising][- = falling]	
	1998	2016	2017	2017 vs 1998	2017 vs 2016
0-1	1,939	258	77	-1,862	-181
1-2	34,102	2,324	2,819	-31,283	495
2-4	41,559	40,485	46,689	5,130	6204
4-6	13,442	29,245	22,821	9,379	-6424
6-8	4,256	11,841	11,000	6,744	-841
8+	504	11,649	12,396	11,892	747
Total	**95,802**	**95,802**	**95,802**	**0**	**0**

From Table 7.1 for 0-12m depth piezometers 49,582 ha or 50% of the mapped ground water area existed in the 0-4m zone in 2017, which in Figure 7.1 is represented in red, orange and yellow combined. This compares to 46% last year.

Comparing years 2016 and 2017 the area of the 0- 1m range has decreased from 258 Ha to 77 Ha. For the same period there was no significant change in the 1-2 m band, showing a slight increase in area if 495Ha.

There has been very little change in area of the 2-4 m water level range in 1998, 2016 or 2017.

Table 7.2: Change in area of groundwater depth ranges below natural surface; 12-60m piezometers; years 2016 to 2017, and years 1998 to 2017

Groundwater Depth Range Below Natural Surface (m)	Years and Area of Groundwater Depth (ha)			Change in Area of Groundwater Depth (ha) [+ = rising][- = falling]	
	1998	2016	2017	2017 vs 1998	2017 vs 2016
0-1	760	44	1	-759	-43
1-2	22,264	220	333	-21931	113
2-4	33,481	28,561	31,994	-1487	3433
4-6	17,300	25,405	23,058	5758	-2347
6-8	10,549	11,502	11,812	1263	310
8+	11,448	30,070	28,604	17156	-1466
Total	**95,802**	**95,802**	**95,802**	**0**	**0**

Table 7.2 Compares the 12 – 60 meter range and demonstrates that there is virtually zero in the 0-1 m range, falling from 44 Ha in 2016 to 1 Ha in 2017. The area of 1 – 2m water table has increased by 113Ha from 2016 to 333 Ha in 2017.

35,245 ha or 37% of mapped ground water area existed in the 0-4m zone in 2017. This area is slightly higher than the 30% in 2016

The 0-1, 1-2 and 2-4 metre values are depicted in red, orange and yellow on Fig 7.2.

Figure 7.1: Ground water depth below natural surface; 0-12m piezometers; Sep 2017

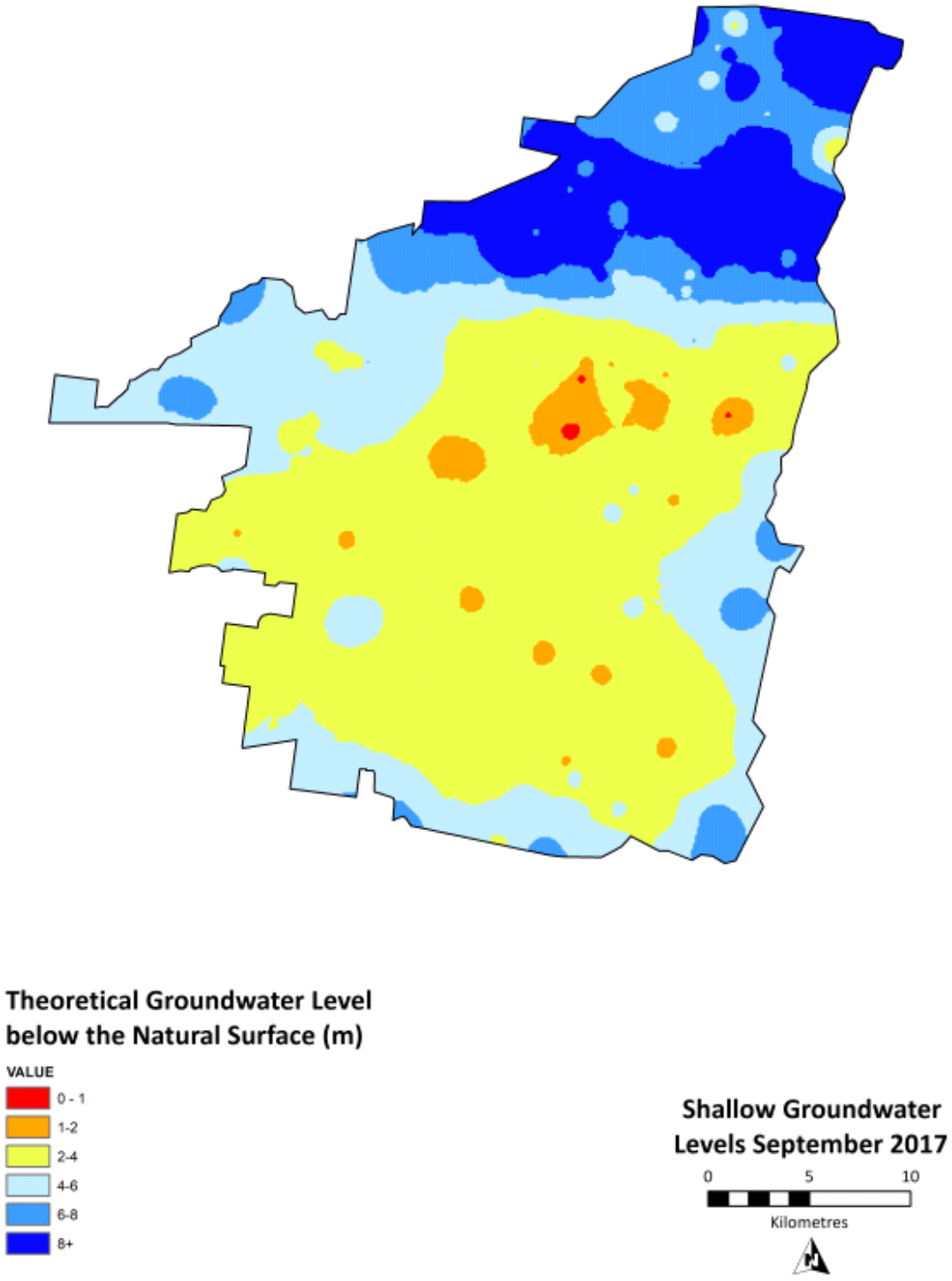
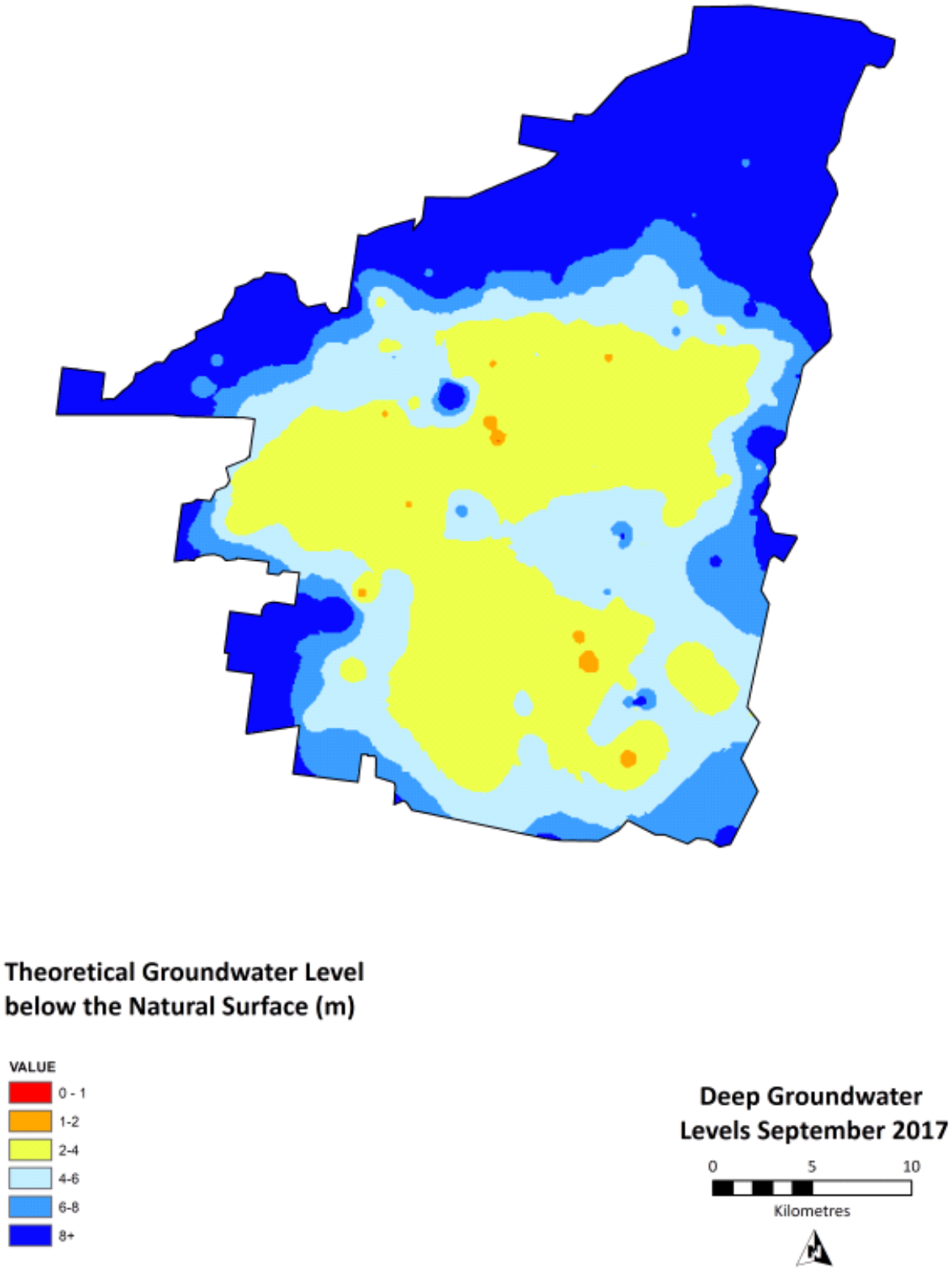


Figure 7.2 Piezometer depth below natural surface: 12-60m Sept 2017



Figures 7.3 and 7.4 depict the ground water depth below natural surface, in the years 2017 and 1998, as converted to the Australian Height Datum (mAHD) and mapped for all of the 0-12m and 12-60m piezometers. These are the upper and lower parts of the Shepparton Aquifer, respectively. These levels represent the ground water height above sea level and can be used to identify the direction of ground water flow. In general, the direction of ground water flow is West South West.

Tables 7.3 and 7.4 are tabular representations of Figures 7.3 and 7.4 respectively.

Table 7.3: Ground Water Depth, below natural surface; 0-12m piezometers; Sep 2017 versus Sep 1998

Ground water Depth Below Natural Surface (mAHD)	2017 Area (Ha)	1998 Area (Ha)
123 – 127 (higher)	3,982	4,151
119 - 122	5,532	39,182
115 - 118	11,491	31,548
111 - 114	31,422	11,211
107 - 110	40,526	5,724
94 – 106 (lower)	2,786	3,986
Total	**95,802**	**95,802**

Table 7.4: Ground Water Depth, below natural surface; 12-60m piezometers; Sep 2017 versus Sep 1998

Ground water Depth Below Natural Surface (mAHD)	2017 Area (Ha)	1998 Area (Ha)
123 – 127 (higher)	1	6,381
119 - 122	2,805	42,337
115 - 118	24,757	34,921
111 - 114	38,105	11,432
107 - 110	27,838	731
94 – 106 (lower)	2,296	0
Total	**95,802**	**95,802**

Figure 7.3 Groundwater Level (mAHD); 0-12 and 12- 60m piezometers Sept 2017

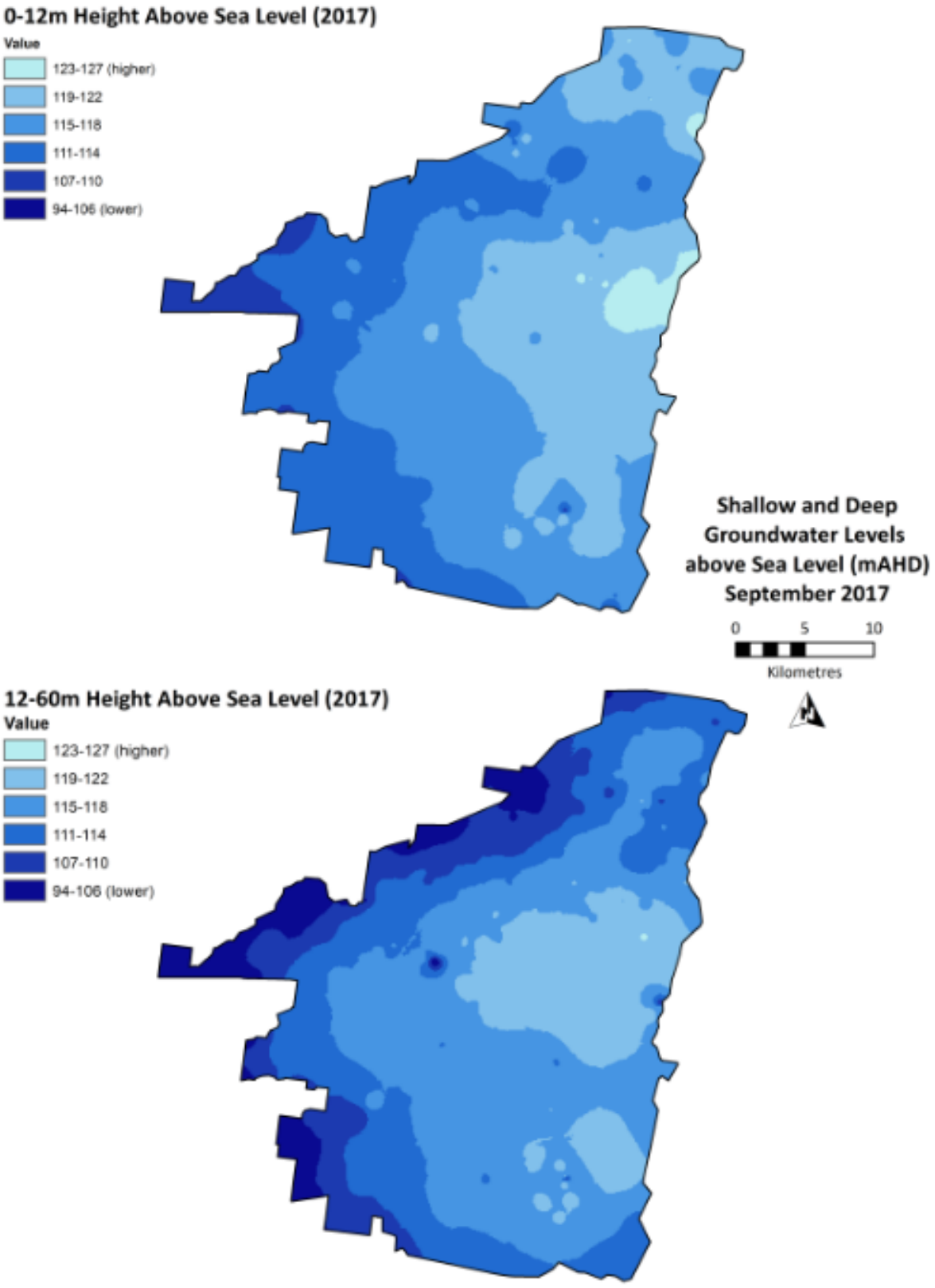


Figure 7.4: Ground Water Level (AHD); 0-12 m & 12-60m piezometers; Sep 1998

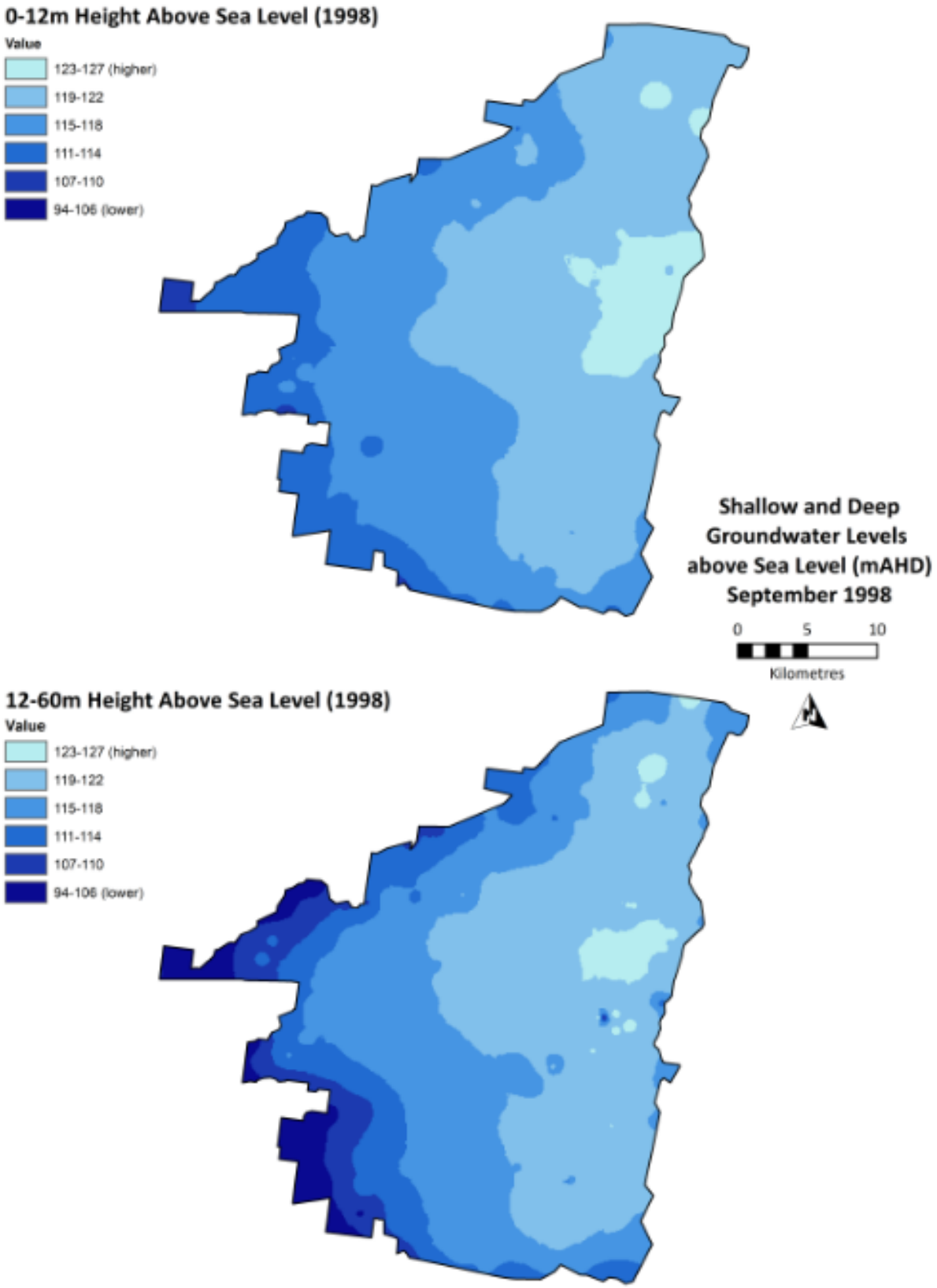


Figure 7.5: Changes in ground water depth, below natural surface 0-12 m piezometers comparing years 2016 to 2017 and 1998 to 2017

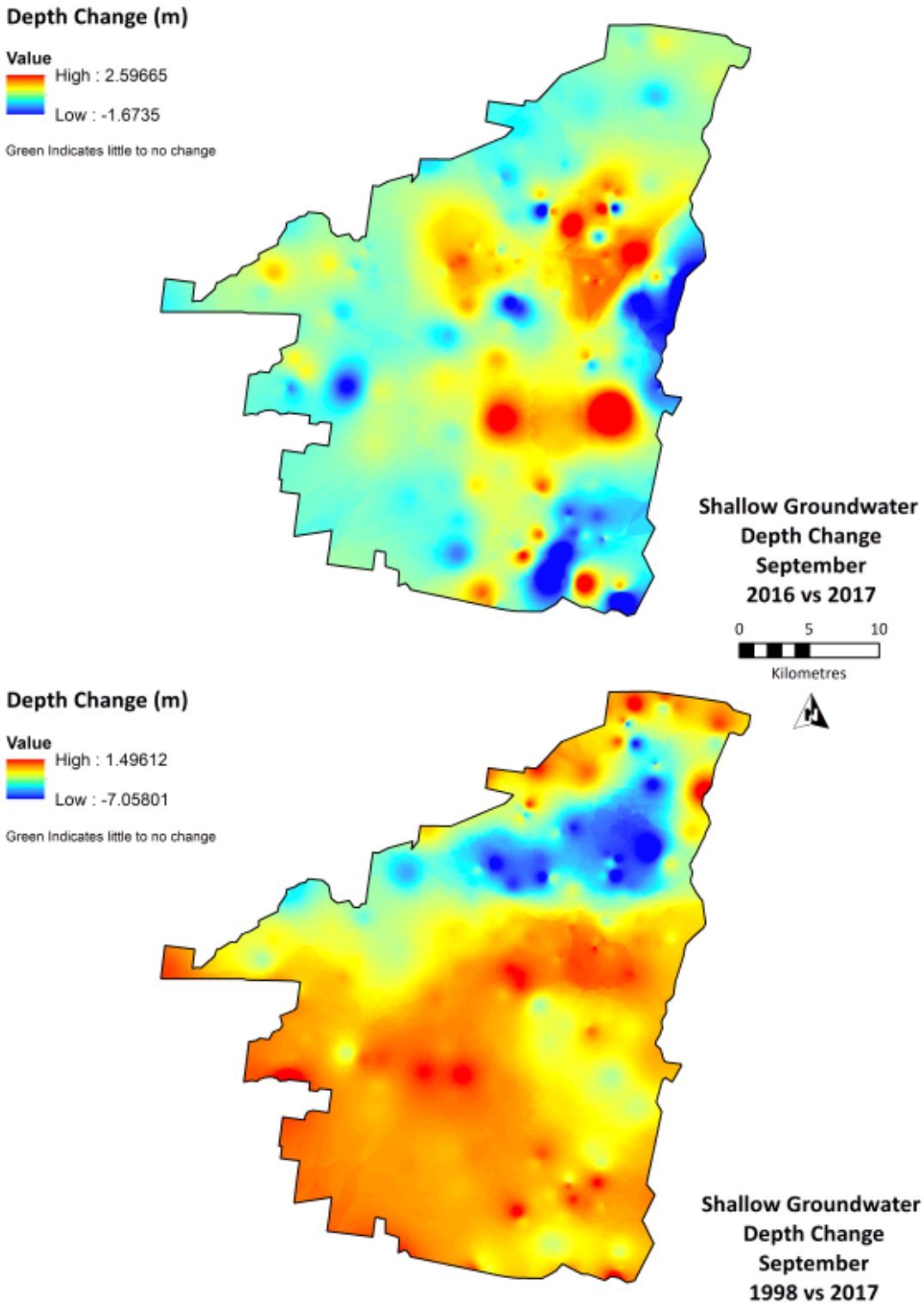


Fig 7.6: Changes in ground water depth, below natural surface 12-60 m piezometers comparing years 2016 to 2017 and 1998 to 2017

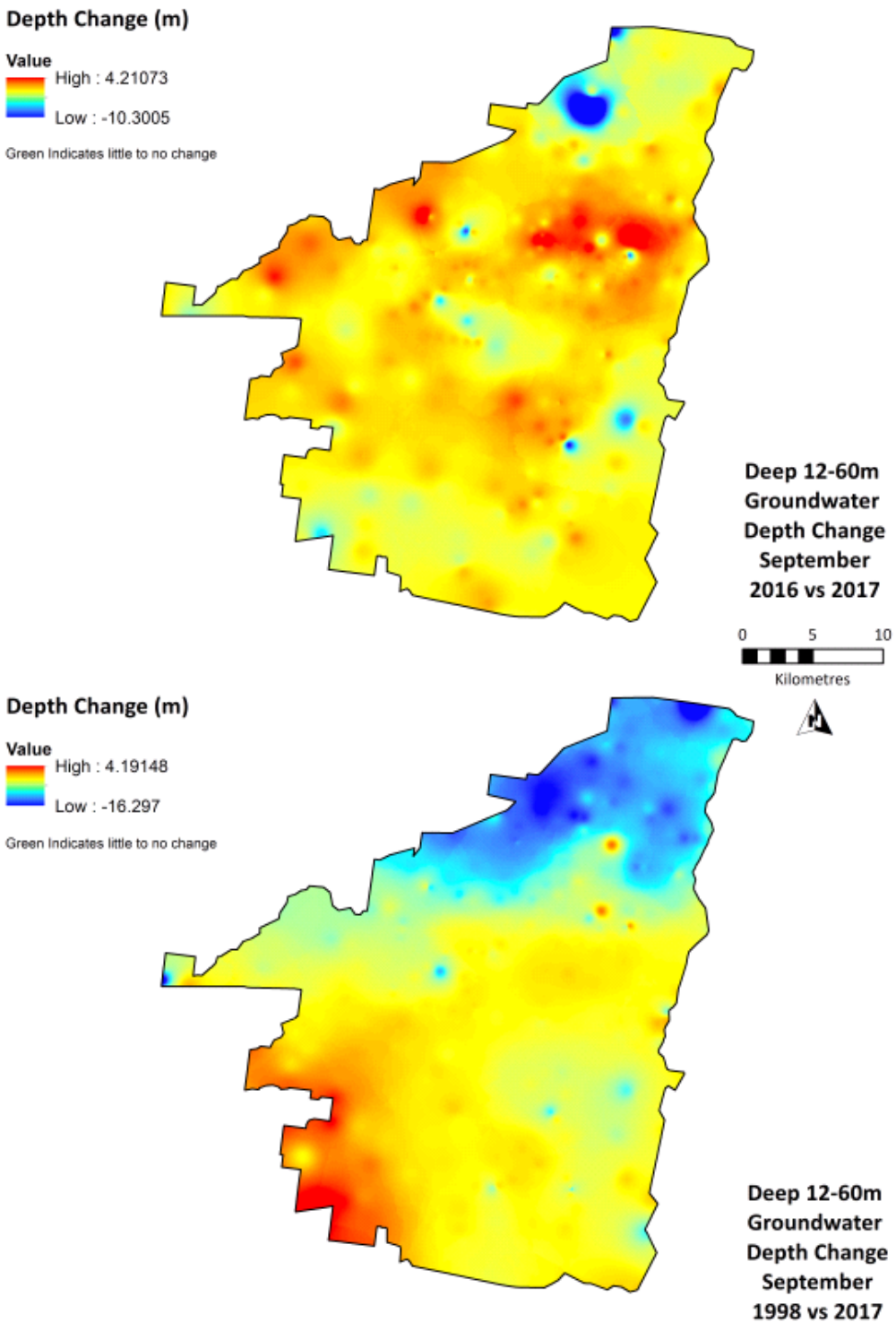
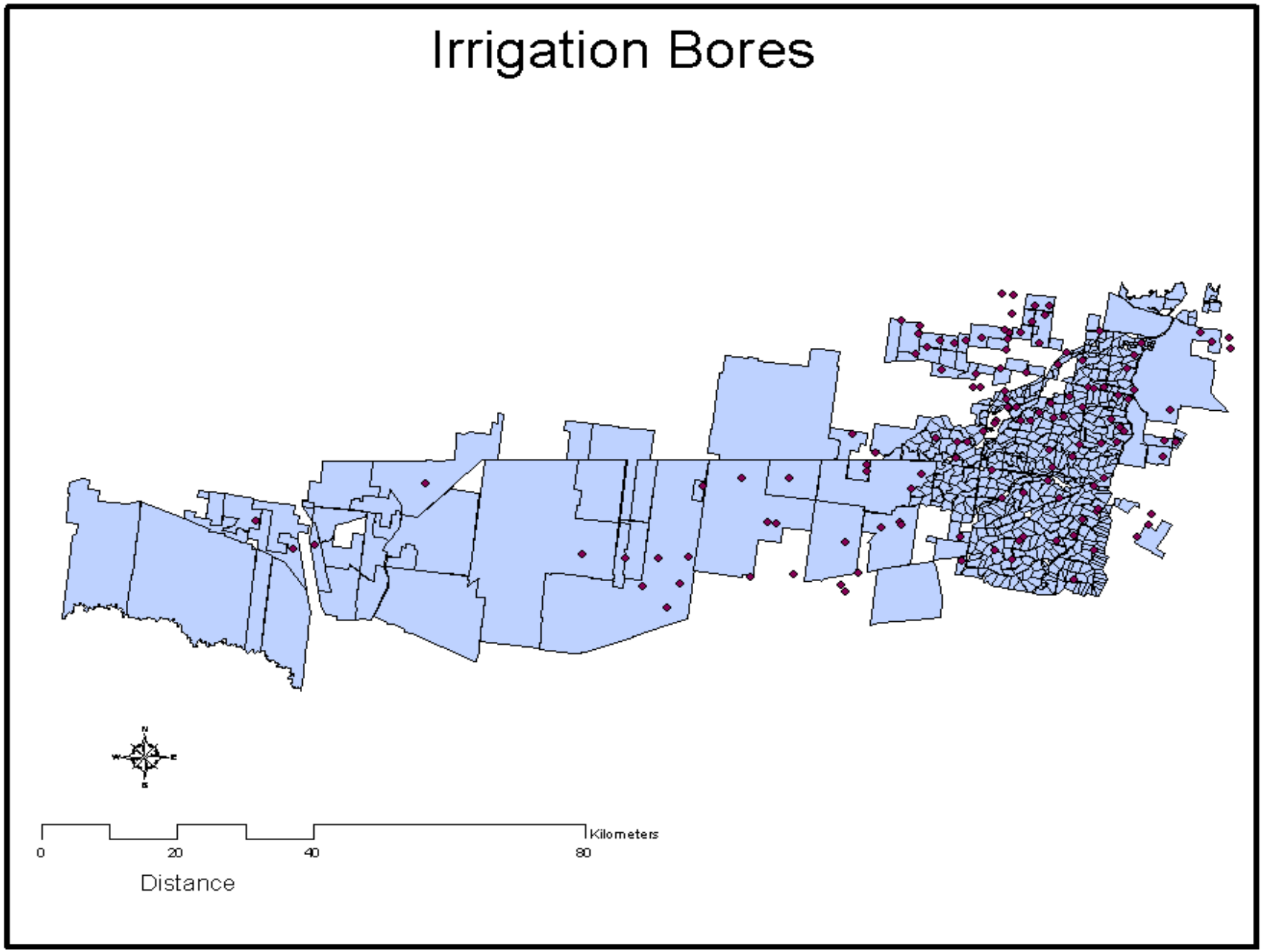


Figure 7.7: Location of CID Irrigation Bores within CICL's Area of operations



8. Environment Protection Licence

8.1 Water Quality

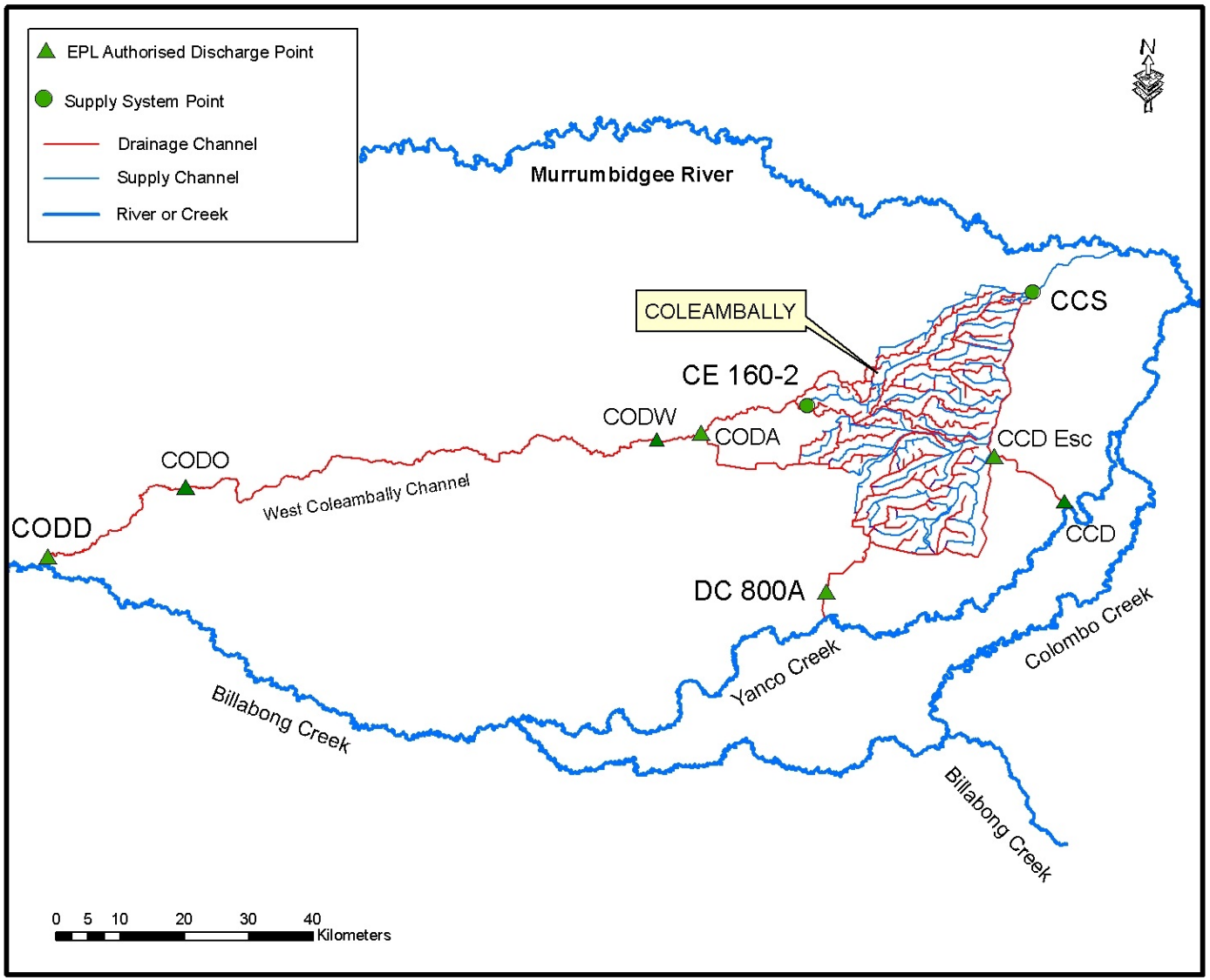
CICL's surface water quality program is aimed at monitoring supply and drainage water quality within CICL's operational area, including at the licensed discharge points. The program monitors flow, turbidity, dissolved oxygen, pH, salinity, chemical and nutrient levels at various points in compliance with licence conditions. CICL's water quality monitoring sites are shown in Figure 8.1.

There are three licensed drainage discharge points; Coleambally Outfall Drain monitoring site A (CODA) is used as a licensed site in place of Coleambally Outfall Drain monitoring site D (CODD) for the Rice Chemical Management Program (RCMP). Although the CODA site is not identified in the Environment Protection Licence (EPL), the site has been selected for its accessibility and is listed as an approved monitoring site. This arrangement has previously been agreed with the Department of Environment and Conservation (DEC), NSW DPI Water and the NSW Environmental Protection Agency.

The approval 2012 refers to the above discharge points; however a different terminology has been used to identify these sites.

At the licensed sites, flow, salinity and the temperature of drainage water are monitored continuously. Monthly water samples are collected from these sites and are analysed for the presence of chemicals as required by CICL's EPL. Samples are also collected and analysed from one supply site at the Main Canal (CCS) and one escape site (CE-160-2) when flowing. Salinity levels at the CCS are monitored constantly.

Figure 8.1: Water Quality Monitoring Sites



8.2 Rice Chemical Monitoring Program (RCMP)

From October to December each year, water samples are collected from a maximum number of 21 sites (dependent on flow) and are analysed for Molinate residue levels as part of the RCMP.

Molinate residue levels are used as an indicator to the presence of other rice chemicals in the drainage water.

There were no detections of Molinate exceeding either the Notification Level or Action Level. The related results are in Table 8.1.

Table 8.1 RCMP Licence Point Results 2016

Date	Sample ID	Sample point	Report No.	Molinate µg/L
18/10/2016	5	CODW	1610005	<1.0
18/10/2016	18	DC800A	1610005	<1.0
24/10/2016	5	CODW	1610011	<1.0
24/10/2016	18	DC800A	1610011	<1.0
31/10/2016	5	CODW	1610018	<1.0
31/10/2016	18	DC800A	1610018	<1.0
7/11/2016	5	CODW	1611002	<1.0
8/11/2016	18	DC800A	1611002	<1.0
14/11/2016	5	CODW	1611004	<1.0
15/11/2016	18	DC800A	1611004	<1.0
21/11/2016	NS	CODW	1611007	NR
21/11/2016	18	DC800A	1611007	<1.0
28/11/2016	5	CODW	1611010	<1.0
28/11/2016	18	DC800A	1611010	<1.0
7/12/2016	5	CODW	1612002	<1.0
7/12/2016	18	DC800A	1612002	<1.0
12/12/2016	5	CODW	1612007	<1.0
12/12/2016	18	DC800A	1612007	<1.0

Note:
NS = Not Sampled *Supply Water Flow Only*
NR = No Result

8.3 Chemical Use

Table 8.2: CICL Chemical Usage in 2016/17

Product	Litres	Kg	Application
Access	85		Boxthorns
Dalapon 740		5125	Cumbungi, water couch
Dicamba Kamba cutlass	1539		Horehound, Bathurst Burr
Garlon	10		Willows (cut bark application)
Gladiator 450	1000		Weed control
Glyp	1000		With roundup on mature weeds
Goal/Cavalier/Striker	5		Additive
Grazon	20		Brush weeds
LI700/VC700/Wil (wetter)	480		Wetter and drift reduction
Magma/Magnacide		168	Submerged Weeds
Roundup	1100		Cumbungi in drains and channels
Sulfomac 750		2	Weeds around structures
Surefire Fortune 500	1		Ants and wasps

8.4 Reportable Incidents

There were six reportable water quality incidents in 2016/17 where Metolachlor, Atrazine and Diuron reached Notifiable levels.

Table 8.3 Reportable water quality incidents

Date	Chemical	Level	Drainage Area
19/10/16	Metolachlor	0.033	CODW
10/11/16	Metolachlor	0.175	CODW
11/11/16	Atrazine Diuron	15.6 20.3	DC800
14/12/16	Diuron	0.88	DC800
20/01/17	Metolachlor	0.277	DC800

1. Appendices

A1: Water Quality Data

Table A1.1 Nutrient (mg/L) and Pesticide Data (µg/L) for CCS at Coleambally Main Canal (Tubbo Wells) for 202016/17

Month	Oxidised Nitrogen as N	Soluble Phosphorous	Total Nitrogen	Total Phosphorous	Total Suspended Solids	Atrazine	Chlorpyrifos	Diazinon	Diuron	Malathion	Metolachlor	Molinate	Simazine	Thiobencarb	Trifluralin	2, 4-D
July	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aug	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sep	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA	NS	NS	NS	NS
Oct	0.21	0.03	1.2	0.09	18	0.081	<0.005	<0.005	0.032	<0.002	0.018	<0.005	0.228	<0.005	<0.005	0.03
Nov	0.19	0.02	0.6	0.11	25	0.019	<0.005	<0.005	<0.005	<0.002	<0.005	<0.005	0.022	<0.005	<0.005	<0.01
Dec	0.13	<0.01	0.3	0.03	39	<0.04	<0.01	<0.01	<0.2	<0.05	<0.02	<1.0	<1.0	<0.5	<2.0	<1.0
Jan	<0.01	<0.01	0.3	0.02	31	<0.005	<0.005	<0.005	<0.005	NA	<0.005	NA	0.019	NA	<0.005	<0.01
Feb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mar	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Apr	0.06	<0.01	0.4	0.02	29	<0.005	<0.005	<0.005	<0.005	<0.002	NA	NA	0.015	NA	<0.005	<0.01
May	0.02	<0.01	0.3	0.02	20	0.014	<0.005	<0.005	<0.005	<0.002	NA	NA	0.018	NA	<0.005	<0.01
Jun	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NF = No Flow
NA = Not Applicable
NS = Not Sampled

Table A1.2 Nutrient (mg/L) and Pesticide Data (µg/L) for CODW (WCC) at Wonga Station for 202016/17

Month	Oxidised Nitrogen as N	Soluble Phosphorous	Total Nitrogen	Total Phosphorous	Total Suspended Solids	Atrazine	Chlorpyrifos	Diazinon	Diuron	Malathion	Metolachlor	Molinate	Simazine	Thiobencarb	Trifluralin	2, 4-D
July	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aug	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sep	0.46	NR	2.5	0.28	72	0.006	<0.005	<0.005	1.3	NA	NA	NA	<0.005	NA	<0.005	0.1
Oct	0.12	0.17	2.1	0.43	130	0.018	<0.005	<0.005	0.01	<0.002	0.03	<0.005	0.014	<0.005	<0.005	0.03
Nov	0.03	<0.01	0.9	0.12	84	0.023	<0.005	<0.005	0.051	<0.002	0.011	<0.005	0.503	<0.005	<0.005	<0.01
Dec	0.04	<0.01	0.6	0.09	107	<0.04	<0.01	<0.01	<0.2	<0.05	<0.02	<1.0	<1.0	<0.5	<2.0	<1.0
Jan	0.41	<0.01	2.5	0.11	128	0.117	<0.005	<0.005	0.007	<0.002	0.008	NA	<0.005	NA	<0.005	<0.01
Feb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mar	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Apr	<0.01	0.02	0.8	0.11	126	0.011	<0.005	<0.005	<0.005	<0.002	NA	NA	<0.005	NA	<0.005	0.04
May	<0.01	<0.01	0.4	0.05	153	0.027	<0.005	<0.005	<0.005	<0.002	NA	NA	0.484	NA	<0.005	<0.01
Jun	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NF = No Flow
NA = Not Applicable
NS = Not Sampled

Table A1.3 Nutrient (mg/L) and Pesticide Data (µg/L) for DC800A at Outfall into Yanco Creek for 202016/17

Month	Oxidised Nitrogen as N	Soluble Phosphorous	Total Nitrogen	Total Phosphorous	Total Suspended Solids	Atrazine	Chlorpyrifos	Diazinon	Diuron	Malathion	Metolachlor	Molinate	Simazine	Thiobencarb	Trifluralin	2, 4-D
July	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aug	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sep	1.23	NR	3.2	0.38	161	0.473	<0.005	<0.005	<0.005	NA	NA	NA	0.01	NA	<0.005	0.06
Oct	0.15	0.23	3.0	0.54	162	0.32	<0.005	<0.005	<0.005	<0.002	0.033	<0.005	0.011	<0.005	<0.005	<0.01
Nov	<0.01	<0.01	2.3	0.28	61	0.513	<0.005	<0.005	0.063	<0.002	0.175	0.009	0.381	<0.005	<0.005	<0.01
Dec	0.04	<0.01	3.1	0.25	95	3.4	<0.01	<0.01	0.88	<0.05	<0.02	<1.0	<1.0	<0.5	<2.0	<1.0
Jan	<0.01	<0.01	2.6	0.22	172	2.81	<0.005	<0.005	0.103	NA	0.277	NA	0.019	NA	<0.005	0.02
Feb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mar	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Apr	0.02	0.02	0.8	0.12	159	0.009	<0.005	<0.005	<0.005	NA	NA	NA	<0.005	NA	<0.005	0.03
May	<0.01	<0.01	0.3	0.03	160	0.021	<0.005	<0.005	0.01	NA	NA	NA	0.02	NA	<0.005	<0.01
Jun	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NF = No Flow
NA = Not Applicable
NS = Not Sampled

Table A1.4 Nutrient (mg/L) and Pesticide Data (µg/L) for Coleambally Catchment Drain at Outfall into Yanco Creek for 202016/17

Month	Oxidised Nitrogen as N	Soluble Phosphorous	Total Nitrogen	Total Phosphorous	Total Suspended Solids	Atrazine	Chlorpyrifos	Diazinon	Diuron	Malathion	Metolachlor	Molinate	Simazine	Thiobencarb	Trifluralin	2, 4-D
July	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aug	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sep	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Oct	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Nov	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Dec	NF	NF	NF	NF	NF	NF	NF	NA	NF	NF	NF	NF	NF	NA	NF	NF
Jan	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Feb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mar	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Apr	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
May	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Jun	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NF = No Flow
NA = Not Applicable
NS = Not Sampled

Table A1.5 Nutrient (mg/L) and Pesticide Data (µg/L) for CODO (WCC) at Oaklands Station for 202016/17

Month	Oxidised Nitrogen as N	Soluble Phosphorous	Total Nitrogen	Total Phosphorous	Total Suspended Solids	Atrazine	Chlorpyrifos	Diazinon	Diuron	Malathion	Metolachlor	Molinate	Simazine	Thiobencarb	Trifluralin	2, 4-D
July	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aug	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sep	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Oct	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Nov	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Jan	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Feb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mar	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Apr	NF	NF	NF	NF	NF	NF	NF	NF	NF	NA	NA	NA	NF	NA	NF	NF
May	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Jun	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NF = No Flow
NA = Not Applicable
NS = Not Sampled

A6 Gauging Information

In addition to the twice yearly checks of all farm supply points, CICL operate and maintain an Accusonic Transit Time meter at the Main Offtake from Murrumbidgee River. This meter is compliant with *NSW Interim Water Metering Standards for Open Channel Metering* and the reported flow rate is verified on a monthly basis with a gauging undertaken by an independent hydrographic contractor using an Acoustic Doppler Current Profiler (ADCP). The results of the gaugings are shown in the table immediately below. WaterNSW Hydrometric group also completed a verification gauging in February 17. During the verification process, if there is more than 5% difference between the Accusonic meter and the gauging, a second gauging is taken.

Prior to commencing the 2016/17 irrigation season a new Accusonic time of flight flow meter was installed at a location 500 meters downstream of CICL's Main Offtake from Gogelderie Weir. The original meter located upstream of the offtake is still functional but was found to be subject to silt deposition which could impact the accuracy. The downstream meter is now the primary meter.

Ventia Gauging No	Date	Start Time (EST)	Gauged Flow M3/s	Gauged Flow ML/Day	Average D/S Accusonic Reading	% Deviation	Area	Mean Velocity	Comments
51	9/09/2016	11:15	21.08	1425	1475	-3.51%	107.8	0.20	
52	9/09/2016	12:15	16.09	1437	1465	-1.95%	65.2	0.25	
53	7/11/2016	12:45	21.08	1821	1750	3.92%	107.8	0.20	
54	10/11/2016	8:40	16.09	1390	1466	-5.45%	65.2	0.25	> 5% difference gauging repeated
55	10/11/2016	9:37	17.13	1480	1470	0.68%	65.6	0.26	
56	15/12/2016	8:21	37.00	3197	3163	1.06%	67.1	0.55	
57	25/01/2017	8:02	31.49	2721	2700	0.76%	72.8	0.43	
58	16/02/2017	8:33	40.81	3526	3519	0.20%	72.1	0.57	
N/A	24/02/2017	10:07	29.09	2514	2404	4.36%	64.8	0.45	WNSW gauging
59	15/03/2017	7:45	25.88	2236	2185	2.28%	64.2	0.40	
60	20/04/2017	9:41	5.49	474	468	1.34%	61.0	0.09	
61	12/05/2017	0:00	8.27	715	698	2.31%	54.5	0.15	

Other regular Quality Assurance checks undertaken against this meter include -

- Both meters report back live through CICL's SCADA system. On a daily basis the flow being reported from both of these meters is compared to ensure the reported flow rates are within 5%.
- CICL also regularly run a report to compare that the cumulative flow total reported from both meters are in agreeance.
- The SCADA system reports flow rates, individual velocities of each of the four velocity paths, and the water -level from which the area is calculated. These parameters, along with analytical parameters such as 'signal to noise ratio' are reviewed on a daily basis.
- The recorded water-level is manually checked against an external reading every two weeks.
- The cross-sectional area is extracted from each gauging and over-plotted against the original surveyed cross section to monitor for scour or siltation.

CICL Area of Operations (AO) Plan

- Rice Chemical Monitoring Point
- Levee

CICL Channel Infrastructure

- Supply Channel
- Drainage Channel
- Escape Channel
- Roads
- Coleambally Irrigation Area
- Kerarbury Irrigation Area (benefitted lands)
- West Coleambally Water Management Area
- DC800 Farms in AO
- State Forests in AO
- Coleambally Irrigation Biodiversity Reserve Trust Blocks
- Local Land Services (LLS)
- Excised from AO post-privitisation
- CICL Additional Area

MURRUM BIDGEE RIVER
STURT HWY
KIDMAN WAY
DARLINGTON POINT
Tombullen Storage Regulator
CCS
DC600C
DC400C
DC530A
DC400A
COLEAMBALLY
DC400D
CE160-2DC500A
DC550A
DC530B
CODA
DC600B
DC600A
CCD
DC820A
DC800D
DC800C
DC830A
DC800B
DC840B
DC800A
COBB HWY
KIDMAN WAY
NEWELL HWY
COLOMBO CREEK
TARCO CREEK
BILLABONG CREEK
JERILDERIE

N

0 5 10 20 30 40 50
Kilometres

GDA94 MGA Zone55

DISCLAIMER
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Note: All CICL land under infrastructure forms part of the AO

Production Date: 28/11/16, Graham Parton
Location: X:\Map_Production\Compliance Maps\A0_Plan.mxd