Annual Compliance Report 2020

Coleambally IRRIGATION

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The Annual Compliance Report 2019/20 is provided to meet the reporting requirements of Coleambally Irrigation Co-operative Limited (CICL) against operating licences:

1. Combined Water Supply Work Approval and Water Use Approval 40CA401473 (Murrumbidgee regulated river water source) and Combined Water Supply Work Approval and Water Use Approvals for Groundwater extraction 40CA403808 and 40WA404593; and
2. Environment Protection Licence No 4652.

I am pleased to advise that from 1 July 2019 to 30 June 2020, CICL has complied with all monitoring and reporting requirements of the:

- Combined Water Supply Work Approval and Water Use Approval 40CA401473, including the CICL Monitoring and Reporting Plan dated 16 March 2018;
- Groundwater Works Approvals 40CA403808 and 40WA404593; and
- Environment Protection Licence EPL 4652.

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

5. Compliance Conditions

30 October 2020

Condition	Condition No	Compliant	ACR Reference	Comment
Groundwater Approval 40CA403808				
Take of Water	MW0737-00001	✓	Section 8 Section 8.6	Compliant meters and extraction volumes within limits
Additional Conditions – Reporting	NS13778 NS14225	✓	As submitted	Annual Compliance Report – as submitted
Groundwater Approval 40WA404593				
Take of Water	MW0737-00001	✓	Section 8 Section 8.6	Compliant meters and extraction volumes within limits
Monitoring and Recording	MW0738-00001	✓	Section 8 Section 8.6	Compliant meters and extraction volumes within limits
Additional Conditions – Reporting	NS13776 NS13778	✓	Section 8	Annual Compliance Report – as submitted
Addition Conditions – Extraction Limit	NS07184	✓	Section 8	Limit of not exceeded
Regulated River Works and Water Use Approval No 40CA401473				
Install, maintain and operate an approved metering device at licenced extraction point	MW2452-00001	✓	Section 8.6 Appendix 5	CICL operate a high accuracy meter with a secondary meter as a backup, meeting the requirements of clause 237 (3) of the Water Management (General) Regulation 2018 requirements
Provide details of – ▪ Quantity of water extracted ▪ Water delivery infrastructure ▪ Cropping details	MW2336-00001	✓	Section 8.2 Section 9	Volume extracted measured with accurate meter. Crop areas are estimates provided by farmers at commencement of irrigation season
Notification of reportable event	MW0051-00001	✓	Section 12.4	Reported to WaterNSW and downstream users
Submission of Annual Compliance Report	DK5891-00002	✓	As submitted	As submitted
CICL Monitoring and Reporting Plan for Combined Approval 40CA401473				
Plan of operations and works	2.1 & 2.2	✓	Section 7.1 Section 7.2	CICL Works have remained unchanged for 2019/20
Statement of compliance	2.3	✓	Section 4	Monitoring and Reporting Plan dated 16th March 2018
Presentation of data and analysis	2.4 – 2.8	✓	Section 8	Printed summary of all data provided in Appendices and a digital copy emailed
Advise of any new measure implemented to limit groundwater recharge and salt discharge	2.9	✓	Section 8.6.6	No new measures implemented

Condition	Condition No	Compliant	ACR Reference	Comment
Reporting on works	2.10 – 2.13	✓	Section 8 Section 9	ACR reports – Volume extracted, all water discharges and deliveries, water balance and cropping areas
Reporting on salinity and salt load	2.14 – 2.16	✓	Section 10	Report covers salinity and salt load
Reporting on groundwater conditions	2.17	✓	Section 11	Annual September measurement included in report
QA of monitoring and reporting	3	✓	N/A	QA standards applied through calibration and validation
Reporting of noxious aquatic weeds and blue green algae	5 & 6	✓	Section 12.4	A BGA event was reported to WaterNSW in March 2020
Monitoring and reporting of all discharge points	Attachment 1	✓	Section 8 Appendix	Report covers flow and salinity from all licence points
Monitoring and reporting of groundwater	Attachment 2	✓	Section 11 Appendix	Report & Attachments cover all piezometer levels and reports changes and trends
NSW EPA Environment Protection Licence No 4652				
Report on licenced discharge points flow	Sect 2 P1.1 – P1.2	✓	Section 8	CODWonga, DC800A, CCD, CODOaklands, Continuous Flow
Monitor concentrations of pollutants & EC discharged	M2.1 – 2.5	✓	Section 12	Routine and event sampling undertaken to meet licence requirements
Environmental Monitoring	M4	✓	Section 12.2	Completed in accordance to specified requirements M4
Continuous recording of flow at licenced discharge points	M7	✓	Section 8 Appendix	Completed

6. Executive Summary

The 2019/2020 irrigation season was characterised by continued drought conditions in much of Australia, including the catchment areas of the Murrumbidgee River. Record low water demand by irrigators created management challenges for Coleambally Irrigation with many irrigation channels being left empty for much of the season.

The season commenced with a general security allocation of 0% that plateaued at 6% by early September (within the summer planting window). Sustained rainfall in the catchments in late summer and autumn saw the allocation rise to 11% at the end of the season. The key water statistics for the preceding three seasons are provided in the following table:

Table 6.1 Water usage in Coleambally Irrigation Area of Operations

Key Statistics	2019/20	2018/19	2017/18
Final Allocation	11%	7%	45%
Metered usage to customers	26,948 ML	104,040 ML	263,634 ML
Net channel losses	13,257 ML	19,442 ML	11,933 ML
Groundwater usage within Area of Operations	92,204 ML	129,734 ML	139,535 ML

Note: Groundwater usage data is provided by WaterNSW and not independently verified by Coleambally Irrigation.

Rainfall totals in the district met the seasonal average with 393.2 mm recorded for the year compared to the Coleambally Long Term Average (LTA) of 396.7 mm. In the first six months of the season only 73.1 mm of rainfall was recorded in total, and for the following six months an average of 53.4 mm of rainfall was recorded each month.

The total evaporation for 2019/20 was 1,964.1 mm which was higher than the LTA of 1,747.1 mm but lower than the previous season's total of 2,111.5 mm. The continued drought conditions through the latter half of 2019 had a negative impact on water allocation and cropping programs, however the wetter conditions experienced in the first half of 2020 have greatly improved the seasonal outlook for 2020/21.The area under supplied irrigation water was 9,272 ha, compared to 28,084 ha in 2018/19.

Table 6.2 Crop areas and total metered usage (ML)

Crop	Area (Ha)	Total metered usage (ML)
Rice	320	3,239
Horticulture	1,213	5,803
Other Summer Crops	2,869	5,331
Winter Crops	4,870	8,270
Stock and Garden	N/A	3,453
Undefined	N/A	851
Total	**9,272**	**26,948**

Note: the above cropped areas are based on customer supplied pre-season crop planning estimates. The quality of this data is assessed and controlled by CICL, however the figures presented should only be viewed as an estimate.

Very dry seasonal conditions coupled with record low surface water use has led to the further decline in the shallow water table within the Coleambally Irrigation Area. The area of land with the water table within 2 m of the surface has decreased to 40 ha, from 101 ha in the previous season.

There were no reportable water quality incidents at the licenced discharged points, however there was a vehicular accident involving third parties in which a large quantity of poultry manure was released into a supply channel in March 2020. The Pollution Incident Response Management Plan (PIRMP) was activated and the water quality monitored however no exceedance in notifiable pollutants was detected with no adverse affects to supply.

7. Plans of the Area of Operations, Authorised Works and Monitoring Sites

To comply with condition 2.1 and 2.2 of CICL's Monitoring and Reporting Plan the following section is provided.

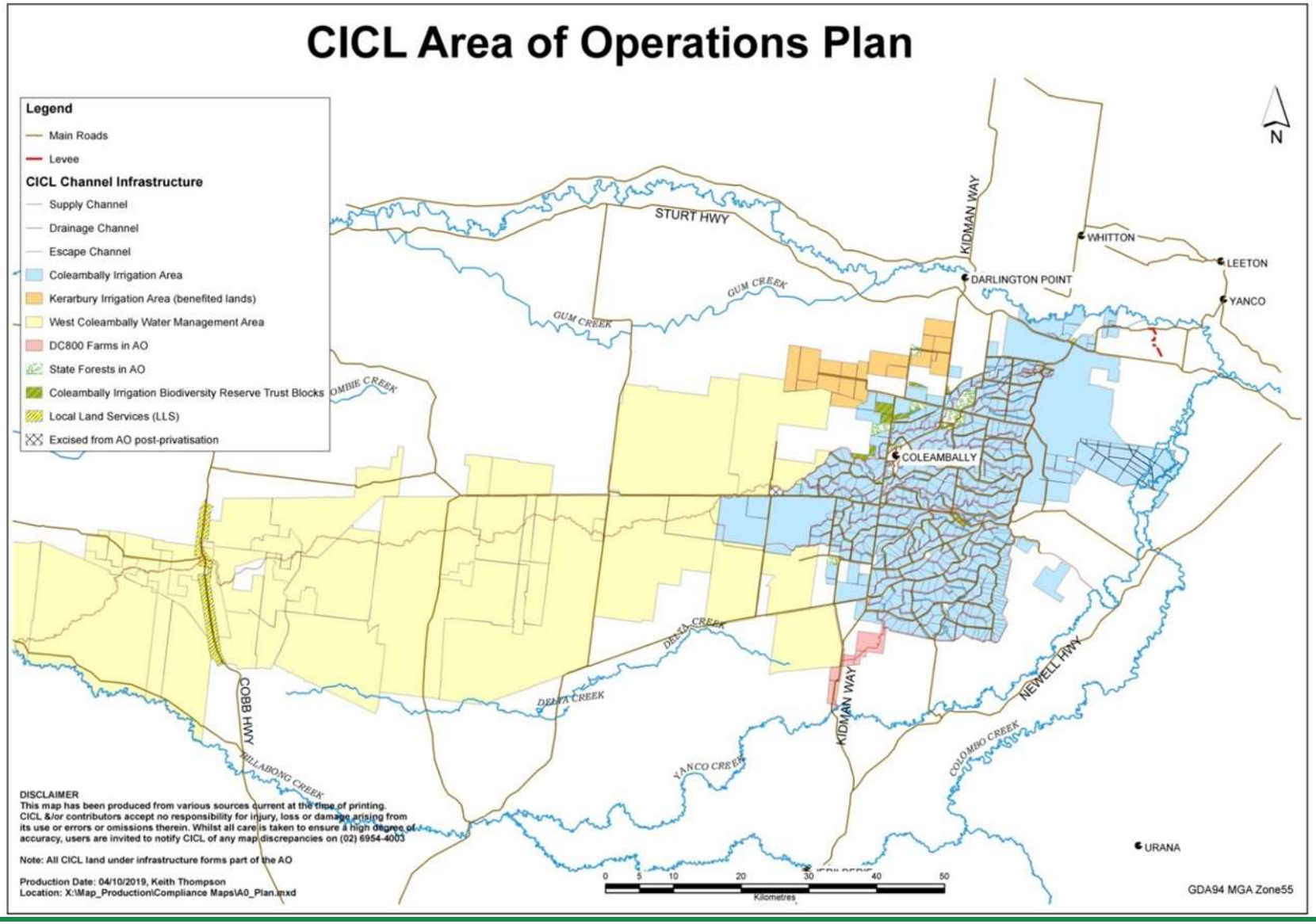
7.1 Coleambally Irrigation Area of Operations

The Coleambally Irrigation Area of Operations is located between the towns of Darlington Point and Jerilderie, New South Wales, in the southern Murray-Darling Basin of Australia as depicted in Figure 7.1.

From the 1 July 2019 to the 30 June 2020 there were no requests made to the Minister to include or exclude land from the Area of Operations.

7. Plans of the Area of Operations, Authorised Works and Monitoring Sites

Figure 7.1: Current Area of Operations of CICL including benefited lands[1]



[1]The term "benefited 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 Area of Operations.

7.2 Plans of Works and Monitoring Sites

The Combined Approval 40CA401473 and the Groundwater 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 Combined Approval also includes three drainage discharge points; Coleambally Catchment Drain (CCD), Drainage Canal DC800A, and Coleambally Outfall Drain D (CODD). One additional monitoring point has also been approved – Coleambally Outfall Drain A (CODA) on the West Coleambally Channel. The CODA monitoring point is used in lieu of CODD due to CODA's closer proximity to Coleambally.

Figure 7.2 illustrates the location of all authorised water supply works and discharge monitoring sites as well as the location of the Kerarbury Channel Off-take Regulator, which supplies water to the benefited lands of the Kerarbury Irrigation Area.

A total of 737 piezometers are located across the Area of Operations to monitor groundwater conditions in the shallow Shepparton Formation aquifer. The distribution of piezometers across the Area of Operations is shown in Figure 7.3.

The following table indicates where data contained in this report is derived 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 in addition to being presented in this report.

Table 7.1 Licence site name and data source comparison

NSW DPI- Water Licenced Site	NSW DPI- Hydrometrics site number	NSW EPA Licenced Site	ACR Data Source
CODA	410110	CODWonga	Salinity from CODA (410110) Flow from CODWonga (CICL FlumeGate)
DC800A	410108	DC800A	Salinity and flow from DC800A (410108)
CCD	410191	CCD	Salinity from CCD (410191) Flow from CCD Escape (CICL FlumeGate)
CODD	410133	CODOaklands	Salinity from CODD (410133) Flow from CODOaklands (CICL FlumeGate)

Figure 7.2 CICL works plan

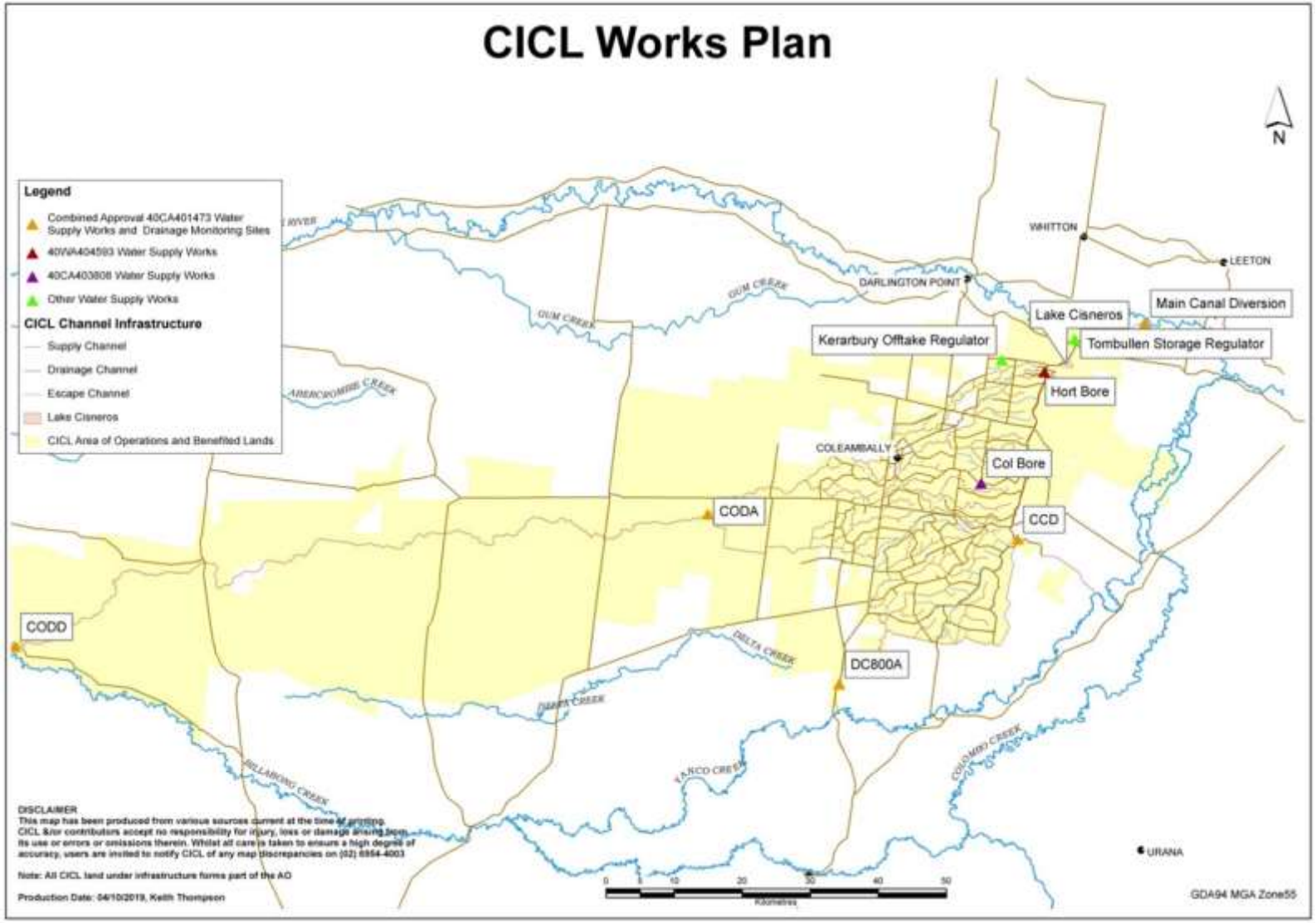
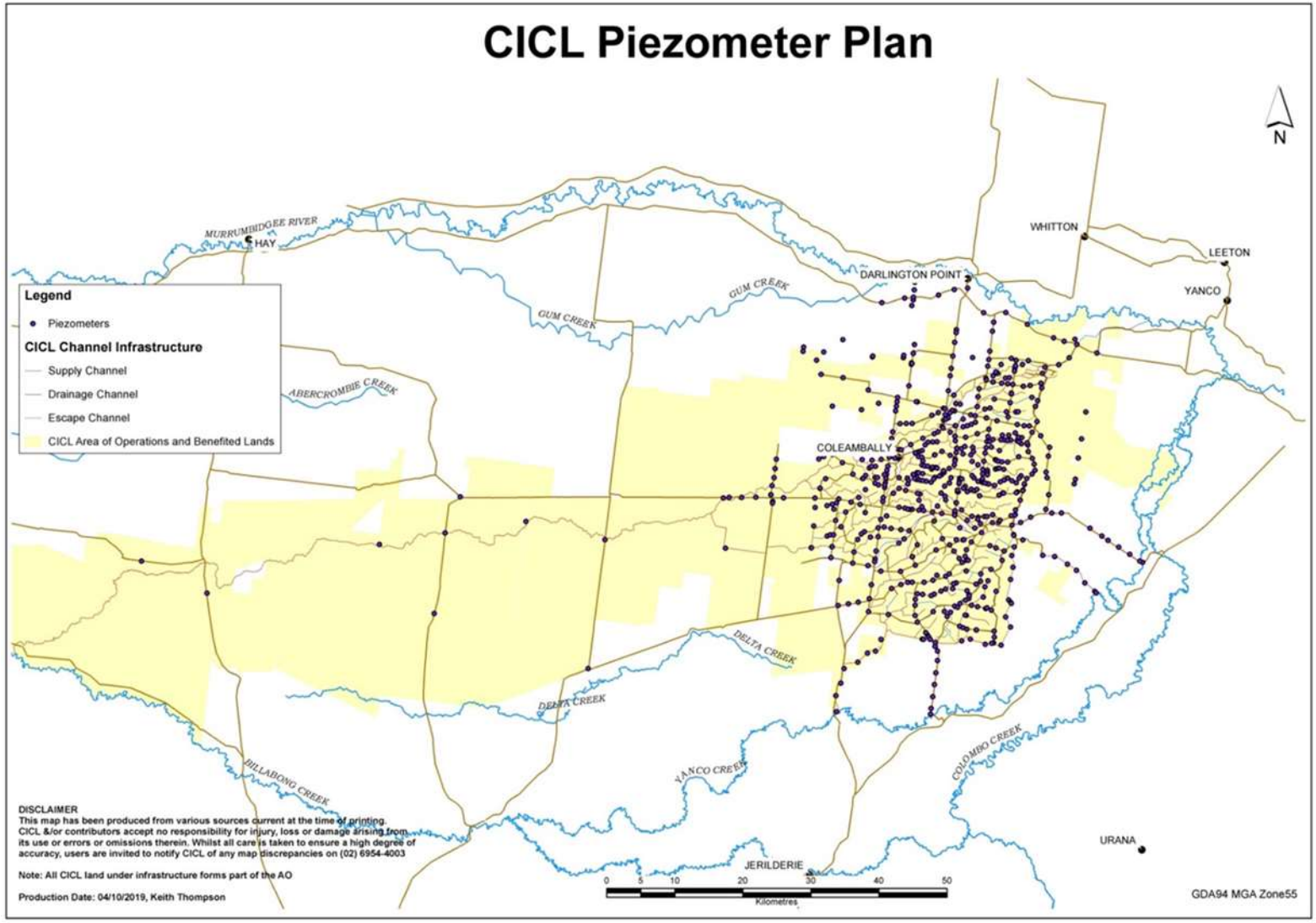


Figure 7.3: Piezometer (monitoring sites) plan



To comply with condition 2.4 of CICL's Monitoring and Reporting Plan the following section is provided.

8.1 Water Allocation

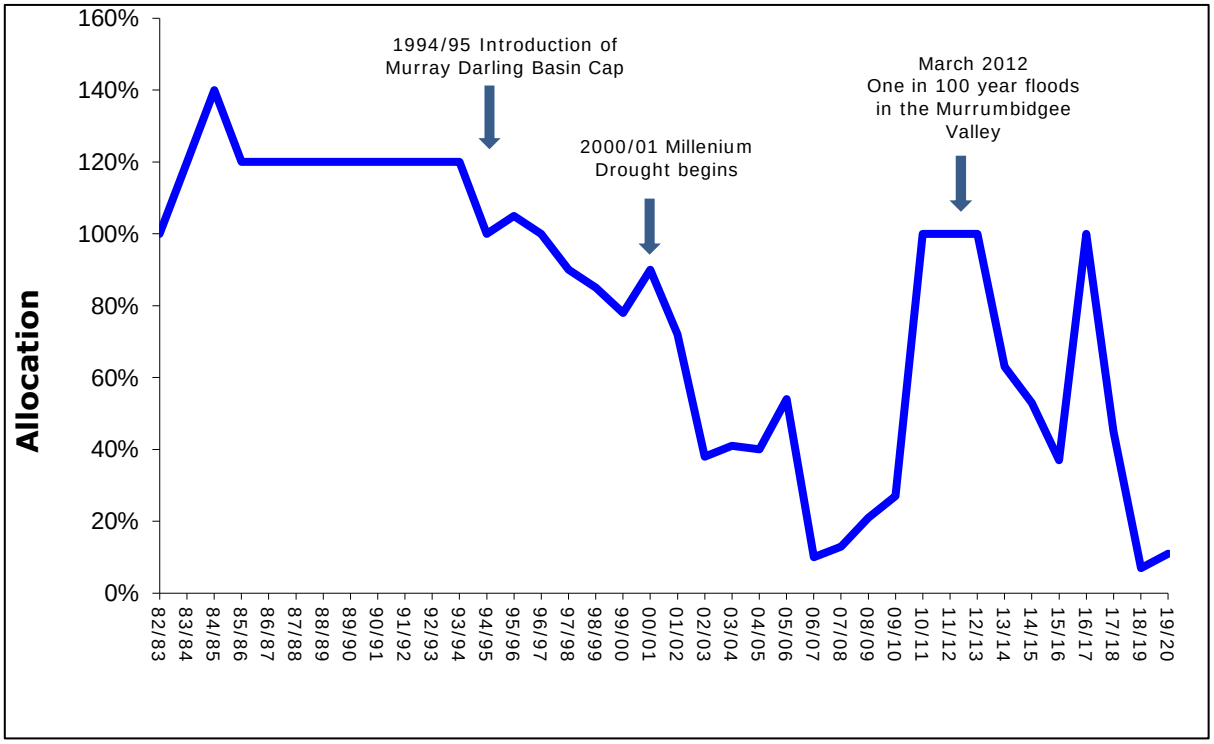
While the general security allocation in the Murrumbidgee Valley for the 2019/20 irrigation season was higher than the preceding season, it was second lowest total allocation since the 2006/07 season (see Figure 8.1).

Table 8.1 shows the dates and announced general security allocations in the Murrumbidgee Valley during 2019/20.

Table 8.1 Cumulative general security water allocations for 2019/20

Date	Announced Allocation (%)
01/07/2019	0
15/08/2019	3
02/09/2019	6
15/05/2020	11

Figure 8.1 Annual general security allocations in the Murrumbidgee Valley since 1982/83



8.2 Monitoring Data

To comply with condition 2.4 of the Combined Approval, the following monitoring data is included:

Monitoring Data	Reference	Provided
Plan of the Area of Operations	Fig 7.1	✓
Plan showing the current location of works	Fig 7.2	✓
Crop type, crop area and water usage data	Section 8.3.4	✓
Piezometer level data	Appendices	✓
Daily surface water extraction and salinity	Appendices	✓
Daily drainage, salinity and flow data	Appendices	✓
Monthly groundwater extraction from CICL's approved works, salinity and salt load	Appendices	✓
Groundwater extraction from other approved works	Appendices	✓
Daily drainage flow and salinity data from three licensed discharge sites and one licensed monitoring site	Appendices	✓
Monthly drainage water quality data for nutrients	Appendices	✓
Monthly drainage water quality data for chemicals	Appendices	✓
Environmental monitoring program results	Section 12.2	✓

8.3 Trends

To comply with condition 2.14, 2.15, 2.16 and 2.5 of CICL's Monitoring and Reporting Plan the following section is provided.

To satisfy condition 2.5 to provide discussion and commentary on the trends evident from the monitoring data CICL compile, CICL uses a benchmark (created) year, which consists of an average of the three years prior to privatisation (1995/96 to 1997/98). Given the highly variable rainfall, water allocation and water use trends year to year, using data from a single season and/or changing the seasons used as a benchmark (comparable data) is considered by CICL to diminish the value of any discussion or commentary on the trends evident.

Salinity data was omitted from all sites during periods where no flow was detected. Where flow was present with no salinity reported the monthly average was used. To achieve improved flow accuracy, CICL has chosen to substitute flow figures for CODA (410110) from the Wonga Rubicon FlumeGate regulator (CODWonga) because the installation of this regulator has imposed backwater effects on the CODA site and rendered its gauging less accurate. Similarly the flow figures for WaterNSW' CODD (410133) have been substituted with data obtained from CICL's CODOaklands regulator as the CICL FlumeGate has a higher level of accuracy than the WaterNSW site.

8.3.1 Salinity

Tables 8.2 to 8.5 show monthly average salinity readings at three discharge points and one monitoring point. Electrical Conductivity (EC) data is provided from WaterNSW gauging stations. However, to obtain more accurate readings, data without flow from a metered site

are omitted and likewise metered flows without salinity are given monthly corrected average EC. In these tables, 2019/20 data is compared with data from the previous two seasons and with the benchmark season. The benchmark consists of an average of the three seasons (1995/96, 1996/97 and 1997/98) preceding the privatisation of CICL.

Table 8.2: Monthly average salinity readings at Discharge Point CCD (410191) on the Coleambally Catchment Drain (µS/cm)

Month	2019/2020	2018/19	2017/18	Benchmark
July	No Flow	No Flow	No Flow	120
August	No Flow	195	255	164
September	No Flow	99	268	213
October	No Flow	71	227	143
November	No Flow	378	339	98
December	291	586	216	96
January	177	521	136	128
February	205	139	161	16
March	164	150	158	64
April	152	130	222	94
May	No Flow	285	No Flow	106
June	No Flow	286	No Flow	158
Average	**198**	**258**	**217**	**117**
Median	**177**	**195**	**222**	**113**

Note: discrepancies with the benchmark values have been found and are discussed in Section 8.4.

Table 8.3: Monthly average salinity readings at Discharge Point DC800A (410108) on the Drainage Channel DC800 (µS/cm)

Month	2019/20	2018/19	2017/18	Benchmark
July	174	No Flow	No Flow	1,496
August	184	270	261	1,661
September	202	226	213	338
October	189	245	255	257
November	181	167	248	314
December	165	180	342	306
January	178	156	213	268
February	191	157	211	240
March	204	188	168	268
April	211	176	197	215
May	259	173	271	226
June	286	181	201	534
Average	**202**	**193**	**234**	**510**
Median	**190**	**180**	**213**	**287**

Table 8.4: Monthly average salinity readings at monitoring point CODA (410110) on the West Coleambally Channel (µS/cm)

Month	2019/20	2018/19	2017/18	Benchmark
July	No Flow	213	437	1,359
August	No Flow	266	475	1,504
September	No Flow	293	327	886
October	424	321	247	399
November	353	322	246	524
December	No Flow	298	240	526
January	344	261	198	457
February	No Flow	No Flow	152	437
March	286	215	269	367
April	339	302	238	459
May	No Flow	239	252	487
June	211	194	284	1,133
Average	**326**	**266**	**280**	**712**
Median	**342**	**266**	**252**	**506**

Table 8.5: Monthly average salinity readings at Discharge Point CODD (410133) on the West Coleambally Channel (µS/cm)

Month	2019/20	2018/19	2017/18	Benchmark
July	No Flow	No Flow	275	1,868
August	No Flow	No Flow	275	1,829
September	No Flow	No Flow	275	536
October	No Flow	No Flow	275	415
November	No Flow	136	434	450
December	No Flow	136	524	531
January	No Flow	No Flow	502	416
February	No Flow	No Flow	502	409
March	No Flow	136	502	374
April	152	136	238	362
May	No Flow	81	273	330
June	152	190	267	406
Average	**152**	**136**	**362**	**660**
Median	**152**	**136**	**275**	**415**

The data in tables 8.3, 8.4 and 8.5 illustrates 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. This can be primarily attributed to the regular supply of water through these to members and WaterNSW in addition to lower farm drainage, with supply flows constituting the majority of all flows exiting the system.

8.3.2 Flow

To comply with condition 2.14, 2.15, 2.16 and 2.5 of CICL's Monitoring and Reporting Plan the following section is provided.

Tables 8.6 to 8.9 show monthly average drainage flows at three discharge points and one monitoring point. Again 2019/20 data is compared with the previous two years data and with benchmark data consisting of an average of the three seasons (1995/96, 1996/97, 1997/98) immediately preceding the privatisation of CICL.

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

Table 8.6: Monthly flow readings (ML) at CCD FlumeGate escape on the Coleambally Catchment Drain (substituted for CCD (410191))

Month	2019/20	2018/19	2017/18	Benchmark
July	0	0	2,110	21
August	0	1,940	2,634	290
September	0	3,134	2,913	887
October	0	1,008	21	1,853
November	0	622	2,596	2,073
December	1,527	1,346	2,857	2,305
January	3,711	3,346	3,159	3,619
February	945	1,647	1,799	1,843
March	1,251	1,248	7,358	2,112
April	11	2,012	280	1,756
May	0	284	133	1,430
June	0	69	372	279
Total	**7,445**	**16,655**	**26,232**	**18,468**
Average	**620**	**1,388**	**2,186**	**1,539**
Median	**0**	**1,297**	**2,353**	**1,800**

Note: CCD is used to deliver water into Yanco Creek for WaterNSW

Table 8.7: Monthly flow readings (ML) at DC800A (410108) on the Drainage Channel DC800

Month	2019/20	2018/19	2017/18	Benchmark
July	72	1	0	432
August	22	545	495	1,197
September	1,099	440	2,369	4,455
October	2,058	209	645	5,962
November	862	407	1,192	5,119
December	1,953	1,322	1,894	5,162
January	2,249	1,043	3,118	7,660
February	398	453	846	6,795
March	617	1,351	3,601	7,816
April	316	491	606	3,721
May	712	319	348	2,961
June	319	236	360	1,675
Total	**10,677**	**6,817**	**15,473**	**52,955**
Average	**890**	**568**	**1,289**	**4,413**
Median	**664**	**447**	**746**	**4,787**

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

Table 8.8: Monthly flow readings (ML) at CODWonga FlumeGate on the West Coleambally Channel (substituted for CODA (410110))

Month	2019/20	2018/19	2017/18	Benchmark
July	0	164	108	619
August	0	11	8	739
September	0	1,362	2,046	4,983
October	291	785	328	4,494
November	2,122	1,631	1,031	5,014
December	0	2,091	1,536	4,041
January	452	316	573	6,806
February	0	0	1,361	5,540
March	1,720	1,872	1,836	8,438
April	1,055	179	70	4,427
May	0	1,399	180	4,209
June	1,752	1,878	5	2,183
Total	**7,392**	**11,688**	**9,083**	**51,493**
Average	**616**	**974**	**757**	**4,291**
Median	**146**	**1,074**	**451**	**4,460**

Note: The West Coleambally Channel is also used to supply customers with water

Table 8.9: Monthly flow readings (ML) at CODOaklands FlumeGate on the West Coleambally Channel (substituted for CODD (410133))

Month	2019/20	2018/19	2017/18	Benchmark
July	0	0	2	282
August	0	0	23	2,150
September	0	0	0	3,327
October	0	0	0	1,914
November	0	152	76	3,187
December	0	23	268	1,536
January	0	0	0	3,523
February	0	0	0	4,461
March	0	26	77	3,517
April	72	99	0	1,814
May	0	21	0	2,511
June	7	189	0	3,053
Total	**79**	**510**	**446**	**31,275**
Average	**7**	**43**	**37**	**2,606**
Median	**0**	**11**	**0**	**2,782**

Note: The CODOaklands Flumegate is also used to supply water

Table 8.10 shows the monthly total volume of water supplied through the Boona and Argoon escapes which supply planned released water through CODA and CODWonga and are reported in accordance with the conditions of section M2.5 of EPL 4652.

Table 8.10: Monthly flow (ML) at Boona and Argoon FlumeGate escapes 2019/20

Month	Boona	Argoon
July	6	0
August	0	0
September	0	0
October	0	599
November	0	2,229
December	0	0
January	0	413
February	0	0
March	0	1,718
April	0	833
May	0	0
June	0	2,150
Total	**6**	**7,942**

8.3.3 Extraction

To comply with condition 2.14 and 2.5 of CICL's Monitoring and Reporting Plan the following section is provided.

For all three extraction points 2019/20 data is compared with the previous two seasons' data and with benchmark data. The Main Canal Off-take benchmark consists of an average of the three seasons (1995/96, 1996/97, 1997/98) preceding the privatisation of CICL. Table 8.11 shows monthly extraction at the Coleambally Main Canal Off-take.

Table 8.11: Monthly extractions (ML) at Main Canal Off-take

Month	2019/20	2018/19	2017/18	Benchmark
July	0	0	8,012	0
August	7,231	19,901	18,664	0
September	5,938	20,533	36,919	42,294
October	6,765	27,226	36,089	38,311
November	11,259	18,050	36,338	57,310
December	8,670	34,168	51,245	66,774
January	9,840	30,380	75,328	95,277
February	3,986	12,580	50,146	61,406
March	6,930	18,449	46,478	105,786
April	14,183	10,727	11,489	54,865
May	7,288	16	7,532	33,506
June	0	0	0	0
Total	**82,090**	**192,030**	**378,239**	**555,533**

Tables 8.12 and 8.13 show monthly extractions from both Col Bore and Hort Bore. The benchmark is derived from the first operational season.

Table 8.12: Monthly extractions (ML) at Col Bore

Month	2019/20	2018/19	2017/18	Benchmark 2007/08
July	0	0	0	0
August	0	23	0	184
September	0	57	0	459
October	0	223	0	376
November	0	97	61	180
December	0	219	250	228
January	0	271	585	317
February	0	221	647	218
March	0	74	474	302
April	177	34	222	339
May	97	0	0	209
June	0	0	0	0
Total	**274**	**1,219**	**2,239**	**2,812**

Table 8.13: Monthly extractions (ML) at Hort Bore

Month	2019/20	2018/19	2017/18	Benchmark 2008/09
July	7	0	0	0
August	4	47	0	0
September	7	50	0	0
October	0	248	4	559
November	432	55	160	120
December	129	415	55	1
January	109	257	612	0
February	264	234	179	0
March	141	298	118	744
April	32	203	482	404
May	4	0	1	0
June	18	0	0	0
Total	**1,147**	**1,807**	**1,611**	**1,828**

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

Due to the inconsistency between WaterNSW and CICL's timing of reading the meters, there are immaterial differences between invoiced and reported figures.

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

8.3.4 Crop Water Use

To comply with condition 2.13 of CICL's Monitoring and Reporting Plan the following section is provided.

Table 8.14 shows the estimated annual values for water deliveries for crop types, with the applicable areas for the water uses estimated from locally relevant crop water use factors.

Table 8.14: 2019/20 crop area, total crop use

Crop	Area (Ha)	Total ML
Rice	320	3,239
Horticulture	1,213	5,803
Other Summer Crops (including pasture)	2,869	5,331
Winter Crops	4,870	8,270
Stock and Garden	N/A	3,453
Undefined	N/A	852
Total	**9,272**	**26,948**

The crop area data is supplied by CICL's customers at the beginning of the irrigation season and is then independently verified by various means, however the data serves only as an approximation of the area actually irrigated as customers can change their cropping decisions during the season.

A low allocation season, coupled with an increase in demand for water on the temporary market, has contributed to rice production diminishing to its lowest seasonal share of area under cultivation and water use ever recorded in the CIA.

Table 8.15 on the following page indicates the change in area of seven major crops in the Coleambally Irrigation Area over the last 23 years. CICL expects that the cropping mix will continue to respond to three main drivers: commodity prices (grower returns); the timing and volume of water allocations and the availability and price of temporary water.

Table 8.15: 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 (%)
2019/20	320	3.4	856	9.2	0	0	934	10.0	2,147	23.0	2,285	24.4	566	6.1	76.1
2018/19	236	3.2	2,252	24.1	0	0	3,641	39.8	7,541	11.0	3,945	9.1	1,115	2.2	89.4
2017/18	6,869	35	4,442	14	2,393	1	5,796	21	6,387	6	3,921	5	2,323	2	88
2016/17	11,484	53.6	5,105	13.5	892	1.9	6,623	17.9	8,462	3.5	10,679	4.1	1,512	1.2	95.7
2015/16	3,603	34.6	8,462	13.5	1,883	3	5,105	20.6	11,484	14.8	6,623	7	892	0.1	94
2014/15	9,103	44	6,757	13	1,666	2	2,602	7	14,226	18	4,737	4	1,716	1	91
2013/14	12,500	43.6	4,358	8.4	1,734	2.4	5,587	6.9	15,071	9.8	5,264	2.8	2,540	1.5	75.4
2012/13	19,071	52.7	4,872	7.7	2,583	3.9	2,089	3	13,698	7.2	6,545	3.6	4,182	1.3	79.4
2011/12	16,745	62.1	4,767	8.2	2,238	2.7	5,280	7.9	15,989	8.7	7,472	4	5,244	1.6	91.2
2010/11	14,512	68.3	4,367	7.2	1,240	1.5	885	1.4	11,334	5.1	8,119	4.2	3,381	1.5	89.2
2009/10	3,668	46	311	2	495	1	0	0	10,635	10	6,903	12	2,523	2	73
2008/09	2,135	33.1	2,472	3.4	308	1.4	0	0	4,215	9.5	4,481	16.3	1,471	4.9	68.7
2007/08	90	1.4	941	1.2	152	0.7	0	0	6,575	20	5,004	20	1,584	6.1	49.4
2006/07	8,518	54.3	1,863	7.6	478	0.8	0	0	12,509	15.9	9,958	7.8	1,602	1	87.4
2005/06	18,025	62.8	3,306	7	2,106	2.9	0	0	13,610	8.4	15,440	8.7	1,748	0.9	90.6
2004/05	8,142	44	3,671	7.2	1,495	2.2	0	0	20,287	18.8	12,865	10.8	2,681	1.3	84.3
2003/04	12,597	55.8	3,545	5.7	1,938	3.5	0	0	21,192	15	12,131	7.5	1,763	0.7	88
2002/03	11,395	46	4,788	9.3	1,788	1	0	0	21,346	20.4	10,183	7.4	2,095	1.7	85.8
2001/02	27,493	67.5	3,808	4.2	3,297	3.4	0	0	21,103	9.2	11,581	6.1	2,191	0.6	91
2000/01	30,440	73.9	4,074	5.7	4,551	5.9	0	0	14,276	4.6	11,998	4.7	2,153	0.4	95.2
1999/00	24,138	77.7	1,178	3.1	2,185	3.9	0	0	12,649	6.1	7,485	4.4	2,152	0.7	95.9
1998/99	24,491	73.8	1,059	1.3	4,339	5.7	0	0	13,963	1.7	13,879	8.1	2,184	1.7	92.3
1997/98	24,624	70.4	1,059	1.3	4,998	7.5	0	0	14,943	7.4	9,964	6.1	2,053	0.4	94.2

8.4 Data Omissions and Discrepancies

This section identifies the variations, discrepancies, data omissions and details of any actions undertaken or proposed to remedy any monitoring and/or reporting deficiencies in satisfying condition 2.6 of the Combined Approval.

In order to provide the most accurate data possible CICL uses data sources from Table 8.16.

Table 8.16: Data sources for licence sites

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 CICL FlumeGate CODWonga (CODWonga)
410108	DC800A	2. DC800A	Salinity and Flow from DC800A (410108)
410191	CCD	3. CCD	Salinity from CCD (410191) Flow from CICL FlumeGate CCD Escape (CCD Escape)
410133	CODD	4. CODOaklands	Salinity from CODD (410133) Flow from CICL FlumeGate CODOaklands

For the CICL FlumeGate site CODWonga in November 2019 there were three days in which no communication signal from the site was received. As there was flow through the FlumeGate at the time, and the volumes weren't reported once the site reconnected with CICL's SCADA system, the volumes for the 9th, 10th and 11th of November have been interpolated.

In the 2018/19 season we undertook a program to update and revise the benchmarks used for salinity and flow reporting. For future reporting periods a new benchmark will be presented in line with the conditions of the Combined Approval.

In the 2018/19 season it was determined that the EC sensor situated at the main offtake needed calibration. This EC sensor provides data used to calculate the salt load for the main offtake and for Tombullen storage offtake. For the 2018/19 season the raw data values were manually adjusted using a number of EC readings taken throughout the season at the site using a handheld meter. The same manual adjustment process was utilised for the 2019/20 season. The EC sensor is due for replacement in the 2020/21 season.

8.5 Monitoring and Testing Data

An electronic copy of all daily and monthly monitoring and testing data required under section 2.7 of CICL Monitoring and Reporting Plan of the Combined Approval is forwarded by email to relevant authorities.

8.6 Quality Assurance and Control Standards

The following section is provided to satisfy condition 2.8 of the CICL Monitoring and Reporting Plan of the Combined Approval.

The following sections list the parameters monitored to comply with licence conditions and explains both the methodology used for data collection and analysis and for the calibration and certification of measuring devices.

8.6.1 Flow Monitoring

The following section is provided to satisfy condition 2.5 of the CICL Monitoring and Reporting Plan of the Combined Approval.

8.6.1.1 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.

In response to the regulated river works and water use approval No 40CA401473 and as required under clause 237 (3) and clause 238 of the Water Management (General) Regulation 2018, CICL contracts an independent contractor to certify the accuracy of the Accusonic 8510 meter on the main canal off-take. The following information is extracted from the report supplied by the contractor to CICL.

Gaugings have been compared to the discharge from the Accusonic at the same time as the measurement to ensure that the Accusonic is accurate.

Coleambally's Accusonic site is located approximately 405 m downstream of the offtake gates. There is an 8° bend in the channel at 290 m downstream of the offtake gates. The bend is gentle, and there is no evidence of siltation or erosion on the banks at that point. The water discharge has the opportunity to remain as close to laminar as possible even after going through the bend before it is measured by the Accusonic. The channel width is approximately 38 m wide. There are enough upstream straight lengths between the regulator and the monitoring site.

There is approximately 730 m of straight channel downstream of the measuring site.

8.6.1.2 Irrigators Water Supply Points

There are 735 water supply points within CICL's Area of Operations – 531 of these are FlumeGates, 3 are SlipMeters, 24 are Doppler flow meters, 18 are Electromagnetic meters, and 159 are mechanical meters.

Verification of customer supply meters is undertaken twice annually by Certified Meter Validators.

8.6.1.3 Col Bore and Hort Bore

In addition to its take of surface water, CICL extracts groundwater from its deep water bores – the Col Bore and Hort Bore. WaterNSW owned MagFlow meters are installed at both bores with meter readings obtained by CICL manually.

8.6.2 Salinity and Salt Load

The following section is provided to satisfy condition 2.14, 2.15, 2.16 and 2.9 of the CICL Monitoring and Reporting Plan of the Combined Approval.

8.6.2.1 Salinity at Water Extraction Works

CICL has continuous monitoring of Electrical Conductivity (EC) at its Main Canal Off-take. This information is reported back through the Rubicon SCADA system. This year there was a calibration error and data provided was compared with physical readings resulting in an increase on uncalibrated results.

8.6.2.2 Salinity at Licensed Discharge Points

CICL uses EC data collected by WaterNSW at three licensed discharge points and one licensed monitoring point. These sites continuously monitor flow and EC. There have been no new measures to limit salt discharge in 2019/20.

8.6.2.3 Salt Load Calculation

The Salt Load has been calculated by using the following formula (derived from the definition of salinity under Schedule 2 of the Monitoring and Reporting Plan), which assumes that 1 ML of water with an electrical conductivity value of 1000 µS/cm contains approximately 640 kg of salt:

Salt Load (kilograms) = (EC/1000 x 0.64) x ML

The Salt Load is calculated using the most accurate flow data available for each site with Salt Load calculated on a daily basis and summed to create monthly figures. EC however is the monthly average of the daily average used in the Salt Load calculation.

8.6.3 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 in the Appendices.

8.6.4 Turbidity and pH

CICL monitors Turbidity and pH parameters in both supply and drainage water using hand-held meters. These meters are calibrated by CICL staff.

8.6.5 Crop Type, Area and Water Usage

Crop type, area and water use information is collected from landholders using summer and winter crop type/area forms. Crop water usage information is calculated based on actual water orders with the amount of water diverted onto individual farms accurately measured. Crop information is provided by landholders prior to the commencement of the irrigation season and as such is an approximation of the actual final area planted.

8.6.6 Groundwater Levels and Groundwater Salinity

Groundwater levels and groundwater salinity parameters are measured by appropriately trained CICL staff. The methodology for groundwater levels and groundwater salinity monitoring was developed in conjunction with the licence authority.

The following statement is provided to satisfy condition 2.9 of the CICL Monitoring and Reporting Plan of the Combined Approval.

CICL has developed and implemented a Water Use Policy which continued in 2019/20 and aims to restrict recharge by limiting water use intensity in the operational area. A copy of the Water Use Policy is available on the CICL Website.

9. Water Management

30 October 2020

The following section is provided to satisfy condition 2.10 of the CICL Monitoring and Reporting Plan of the Combined Approval.

Tables 9.1 and 9.2 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 9.1: 2019/20 Water (ML) taken through Water Supply Works against Water Access Licences

Surface Water Licences (Works Approval 40CA401473)	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total (ML)
High Security Access Licence **40AL401469**	0	2,130	0	0	0	0	0	0	0	0	0	0	**2,130**
High Security Access Licence **40AL417488**	0	5,007	996	0	0	0	0	0	0	0	0	0	**6,003**
General Security Access Licence **40AL401471**	0	0	0	0	0	0	0	0	0	0	0	0	**0**
General Security Access Licence **40AL405267**	0	0	0	0	0	0	0	0	0	399	0	0	**399**
High Security Access Licence **40AL401470**	0	0	70	0	0	0	0	0	0	0	0	0	**70**
High Security S & T Access Licence **40AL401472**	0	0	3,227	0	0	0	0	0	0	42	0	0	**3,269**
Conveyance Access Licence **40AL402990**	0	0	617	3,832	1,866	4,690	3,320	2,425	4,974	2,513	0	0	**24,236**
Supplementary Access Licence **40AL402991**	0	0	0	0	0	0	0	0	0	0	2,678	0	**2,678**
Total	**0**	**7,136**	**4,910**	**3,832**	**1,866**	**4,690**	**3,320**	**2,425**	**4,974**	**2,954**	**2,678**	**0**	**38,784**
Aquifer Access Licence 40AL403806	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Total (ML)**
Col Bore (Works Approval **40CA403808**)	0	0	0	0	0	0	0	0	0	177	97	0	**274**
Hort Bore (Works Approval **40WA404593**)	7	4	7	0	432	129	109	264	141	32	4	17	**1,147**
Combined Total	**7**	**7,141**	**4,917**	**3,832**	**2,298**	**4,819**	**3,429**	**2,689**	**5,115**	**3,163**	**2,778**	**17**	**40,205**
Authorised Credits													**1,038**
Total													**41,243**

9. Water Management

The following information is provided to satisfy condition 2.11 of the Combined Approval. In 2019/20 there were no accidental releases from drains. Figures for delivered water are taken from monthly reports which are compiled mid-month.

Table 9.2: 2019/20 Volumes (ML) released without credit, released from drain and released to customers

2019/20	Released without credit from escapes	ML Released from Drains	Delivered to CICL Customers
Jul	0	0	0
Aug	0	0	4
Sep	0	0	2,707
Oct	0	0	2,780
Nov	0	0	2,852
Dec	0	0	2,821
Jan	0	0	3,640
Feb	0	0	2,570
Mar	0	0	1,408
Apr	0	0	3,306
May	0	0	3,937
Jun	0	0	923
Total	**0**	**0**	**26,948**

9.1 Estimated Annual Volumes

The following section is provided to satisfy condition 2.12 of the CICL Monitoring and Reporting Plan of the Combined Approval.

Table 9.3 indicates the estimated annual volumes of net channel losses, including deliveries, escapes, recycling, evaporation, rainfall, change in storage and seepage.

The gains from rainfall and losses through evaporation have been calculated for the 2019/20 irrigation season only.

For the purpose of calculating evaporation in Table 9.3, the channel surface area has been estimated as 555 ha.

Table 9.3: 2019/20 net channel loss accounting

Losses	Estimated volume (ML)
Escapes	0
Evaporation	-8,020
Change in storage	0
Seepage	-8,029
Total Losses	**-16,049**
Rainfall	2,792
Net Channel Losses	**-13,257**

9.2 Water Balance for the Area of Operations

The following section is provided to satisfy condition 2.10, 2.11 and 2.12 of the CICL Monitoring and Reporting Plan of the Combined Approval.

The CICL system water balance is outlined in Table 9.4.

Table 9.4: 2019/20 water use (ML)

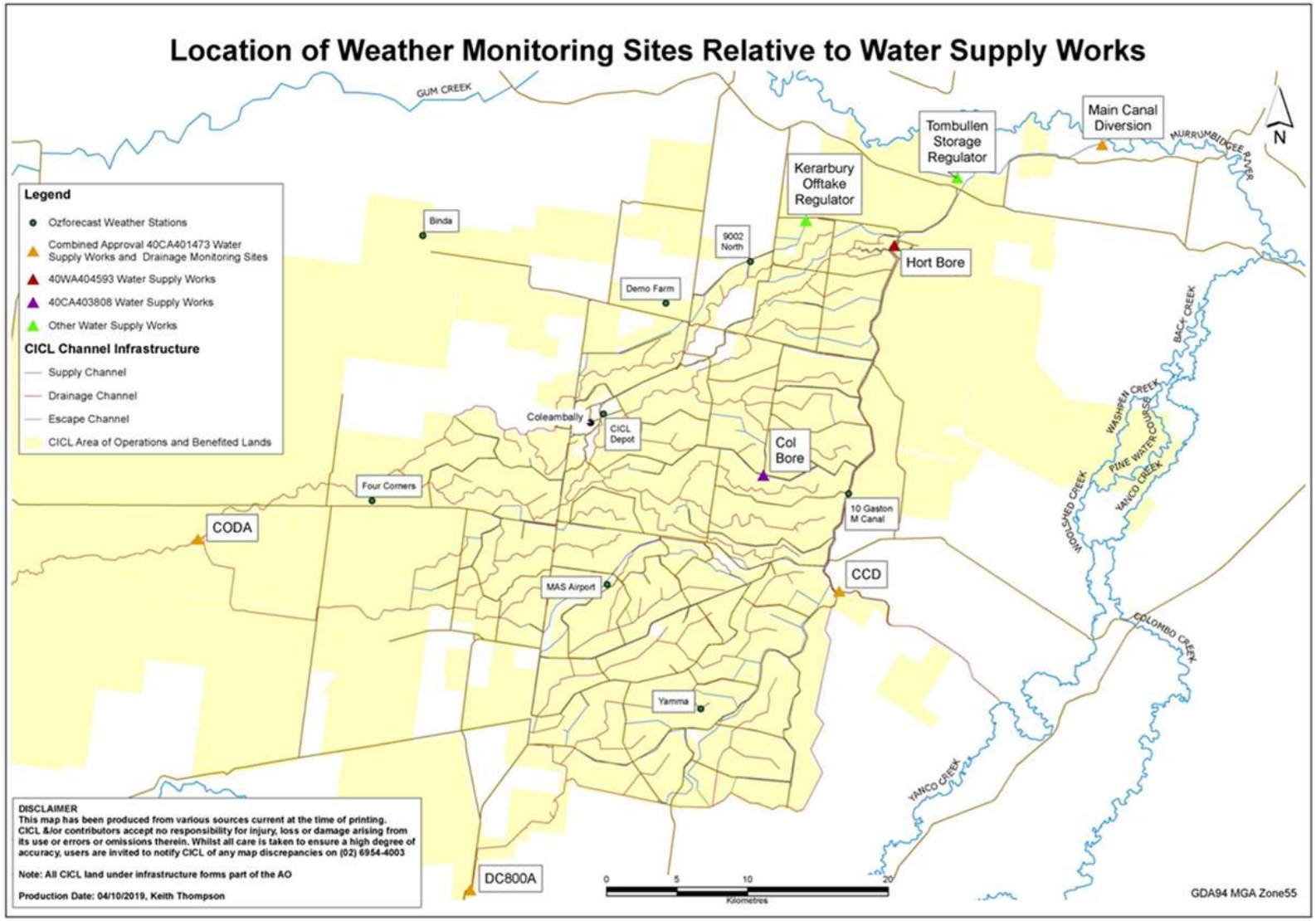
Bulk Accounts (all licences)	Debit	Credit
Carryover 18/19		61,908
Allocation (AWD)		175,332
River Operational & Environmental Deliveries		43,306
Net Annual Transfers	78,559	
River Diversions	82,090	
Groundwater Extractions	1,421	
As at 30 June 2020	**162,070**	**280,546**

Internal Water Accounting	Debit	Credit
CICL Diversions (Bore pumping + River Diversions)		40,205
Deliveries	26,948	
Net Channel Losses	13,257	
As at 30 June 2020	**40,205**	**40,205**

9.3 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 9.1 below.

Figure 9.1: Location of weather monitoring sites relative to water supply works



9.4 Estimated Annual Evaporation / Rainfall at each Water Supply Work

The following section is provided to satisfy condition 2.13 of the CICL Monitoring and Reporting Plan of the Combined Approval.

CICL records both rainfall and evaporation at the CICL Depot Bureau of Meteorology weather station (074249). Table 9.5 shows annual rainfall and evaporation was recorded as 393.2 mm and 1,964.1 mm respectively, this represents 99% and 113% of the long-term average. Depot weather data can be found in electronic attachments.

Table 9.5: Rainfall and evaporation recorded at CICL Depot weather station in 2019/20

CICL Depot	Rain (mm)	LTA Rain (mm)	Evap (mm)	LTA Evap (mm)
July	26.0	32.5	47.1	39.1
Aug	10.8	34.3	78.2	65.1
Sept	9.5	32.7	132.9	102.2
Oct	5.2	38.3	207.7	165.2
Nov	17.4	31.6	276.8	212.5
Dec	4.2	31.0	337.7	262.1
Jan	65.9	33.7	304.7	276.7
Feb	65.6	28.7	228.7	225.3
Mar	60.1	29.9	167.1	185.5
Apr	89.0	31.6	92.2	112.0
May	14.4	35.1	58.1	63.4
Jun	25.1	37.3	32.9	38.0
Total	**393.2**	**396.7**	**1,964.1**	**1,747.1**

9.5 Distribution of Irrigation Intensity

The following section is provided to satisfy condition 2.13 of the CICL Monitoring and Reporting Plan of the Combined Approval.

The irrigation intensity for the main supply per region is represented in Table 9.6. The regions listed below have been altered to more closely align with common irrigation practices within the Area of Operations.

The Coleambally Irrigation Area consists of all farms with access to the CICL drainage network and is comprised of farmland that has historically been the most intensively irrigated farmland within the Area of Operations.

The West Coleambally Channel is comprised of landholdings that have access to supply water from the West Coleambally Channel and has historically been the least intensively irrigated farmland within the Area of Operations.

Coleambally External refers to those landholders that are situated adjacent to the Coleambally Irrigation Area but do not have access to the CICL drainage network.

Table 9.6: Regional distribution of irrigation intensity (ML/ha)

Region	Use (ML)	Area (ha)	Intensity ML/ha	% of use
Coleambally Irrigation Area	18,881	79,495	>0.1ML<1ML	70%
West Coleambally Channel	1,916	313,578	<0.1ML	7%
Coleambally External	6,151	71,129	<0.1ML	23%
Total	**26,948**	**464,202**	**<0.1ML**	

Note: The intensity ranges used in the above table are <0.1ML/ha, >0.1ML/ha to <1ML/ha, >1ML/ha.

10. Salinity and Salt Load

The following section is provided to satisfy condition 2.14 of the CICL Monitoring and Reporting Plan of the Combined Approval.

Hydrometrics site 410191 (CCD) is a supply point for WaterNSW customers and these flows are measured at the adjacent CICL delivery point – not at the WaterNSW gauge. Under condition 3 it is understood that CICL may include data of acceptable quality from other sources to meet the monitoring and reporting requirements of the Combined Approval. 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. Table 8.16 indicates where data is sourced. The WaterNSW CCD and CODD gauges are impacted by backwater during periods of high flow in the Yanco and Billabong creeks and are considered unreliable.

The salt load is calculated using a daily average EC and total daily Salt Load. The following tables depict exact numbers for flow (ML) and Salt Load (T) however the salinity figures are a monthly average not a weighted average so as reported figures remain consistent.

Table 10.1: Salinity (µS/cm) and Salt Load (Tonnes) entering CICL's Area of Operations in 2019/20

2019/20	Main Canal			Col Bore			Hort Bore		
Month	ML	µS/cm	Salt (T)	ML	µS/cm	Salt (T)	ML	µS/cm	Salt (T)
July	0			0			7	347	2
August	7,231	219	1,017	0			4	347	1
September	5,938	209	801	0			7	347	2
October	6,765	195	844	0			0		
November	11,259	189	1,342	0			432	347	96
December	8,670	187	1,042	0			129	347	29
January	9,840	188	1,174	0			109	347	24
February	3,986	197	504	0			264	347	58
March	6,930	208	929	0			141	347	31
April	14,183	235	2,126	177	624	71	32	347	7
May	7,288	219	942	97	624	38	4	347	1
June	0			0			18	347	4
Sub Total	**82,090**		**10,721**	**274**		**109**	**1,147**		**255**
Salt Total	**11,085**	**ML Total**	**83,511**						

10. Salinity and Salt Load

Tables 10.2 to 10.4 are provided to satisfy condition 2.15 of Combined Approval.

WaterNSW Tombullen Storage is an in line storage used by WaterNSW to buffer Murrumbidgee downstream demand. It is located off main canal at the start of CICL's supply system. Whilst it is not a discharge monitoring site under the Combined Approval it does however account for a significant volume of water (and hence, salt) delivered by CICL through our main extraction site each season. For the Salt Load tables actual volume (ML) and actual Total Salt (Tonnes) are used however salinity (EC) is displayed as a monthly average. Where daily salinity was not available the monthly average salinity (EC) was used to calculate salt load.

Table 10.2: Salinity (µS/cm) and salt load (Tonnes) exiting CICL's Area of Operations in 2019/20

Month	Flow and EC @ DC 800A			Flow @ CODWonga EC @ CODA			Flow @ CCD Escape EC @ CCD			Flow @ Tombullen Escape EC @ Main Canal Off-take		
	ML	µS/cm	Salt (T)	ML	µS/cm	Salt (T)	ML	µS/cm	Salt (T)	ML	µS/cm	Salt (T)
July	72	174	8	0			0			0		
August	22	184	3	0			0			0		
September	1,099	202	142	0			0			36	209	5
October	2,058	189	258	291	424	79	0			0		
November	862	181	98	2,122	353	502	0			6,313	189	740
December	1,953	165	224	0			1,527	291	329	0		
January	2,249	178	220	452	344	92	3,711	177	549	0		
February	398	191	46	0			945	205	122	0		
March	617	204	76	1,720	286	345	1,251	164	132	0		
April	316	211	41	1,055	339	221	11	152	1	10,543	235	1,589
May	712	259	111	0			0			4,265	219	556
June	319	286	60	1,752	211	255	0			0		
Sub Total	**10,677**		**1,287**	**7,392**		**1,494**	**7,445**		**1,134**	**21,157**		**2,890**
Salt Total	**6,806**	**ML Total**	**46,670**									

The seasonal flow, salinity and salt load for the CODD is displayed separately in Table 10.3 as it is situated directly downstream from the site CODA. Including both sites in the same table would lead to double counting of the salt and flow data.

Table 10.3: Volume of water exiting CICL's Operational Area at CODOaklands, salinity (µS/cm) at CODD (410133) and calculated salt load (Tonnes) in 2019/20

2019/20	Flow @ CODOaklands EC @ CODD		
Month	**ML**	**µS/cm**	**Salt (T)**
July	0		
August	0		
September	0		
October	0		
November	0		
December	0		
January	0		
February	0		
March	0		
April	72	152	7
May	0		
June	7	152	1
Total	**79**		**8**

Table 10.4 represents a Simple Annual Salt Balance comprising the imported, exported and retained Salt Load for the area associated with each separate water supply work and satisfies condition 2.16 in the CICL Monitoring and Reporting Plan of the Combined Approval.

Table 10.4: Simple salt balance (Tonnes) in 2019/20

Inflow Sites	Imported Salt (T)	Outflow Sites	Exported Salt (T)
Main Canal	10,721	DC800	1,287
Col Bore	109	DC500	1,494
Hort Bore	255	CCD	1,134
		WaterNSW Tombullen	2,890
Total	**11,085**		**6,806**
Balance	**4,270**		

The following section is provided to satisfy condition 2.17 of CICL Monitoring and Reporting Plan of the Combined Approval.

11.1 Groundwater Conditions within the Area of Operations

CICL has a network of piezometers throughout its Area of Operations which is used to monitor groundwater conditions. The licence condition 2.17 of the Combined Approval requires that piezometers be read annually in August (+/- 2 weeks). It is CICL's practice to read them again in March in order to have a more complete understanding of groundwater conditions affecting our area. The related data is analysed using Arc Map GIS and MS Excel software.

In September 2020, 687 of CICL's 737 licensed piezometers were read. Of those read, 84 were recorded as being dry, and a further 35 as destroyed. Combining those piezometers that were either read or recorded as being dry (ie all piezometers that were read and in working condition) a total of 93% of piezometers were read.

Piezometers are read to an accuracy of +/- 5 cm 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 < 12 m deep; and pressure levels from the lower Shepparton aquifer via piezometers 12 m – 60 m deep.

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

All piezometers with a recorded depth are mapped, except those recorded as dry, blocked, buried or otherwise damaged.

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

Figure 11.1 is a contour map of the piezometric levels below natural surface for September 2020. A 3D surface of piezometric levels was created from point measurements (depth to piezometric level 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 11.1 and 11.2 are tabular representations of Figure 11.1. From Table 11.1 for 0-12 m depth piezometers 2,973 ha or 3% of the mapped groundwater area existed in the 0-4 m zone in 2020, which in Figure 11.1 is represented in red, orange and yellow combined. This compares to 9% in 2019. For the same period there was also a reduction in piezometric level within 2 metres of the surface from 101 ha to 40 ha.

In 2019/20 CICL improved the reporting practices for piezometric levels resulting in portions of land within the Coleambally Irrigation Area denoted by the label 'no data'. This area equates to 1,397 ha or 1.5% of the Coleambally Irrigation Area for the 0-12 m piezometric level and 50 ha or 0.05% of the 12-60 m piezometric level. These results are due in part to improved reporting practices as well as increasingly dry conditions. 56 piezometers within the 0-12 m range were recorded as dry in September 2020, compared to 27 in September 2019.

Table 11.1: Piezometric level below natural surface; 0-12 m piezometers; Sept 2020 comparison of areas 1998, 2019 & 2020

Piezometric Level Below Natural Surface (m)	Years and Area of Piezometric Level (ha)				Change in Area of Piezometric Level (ha) [+ = increasing][- = decreasing]	
	1998	2018	2019	2020	2020 vs 1998	2020 vs 2019
Less than 2 metres	36,041	470	101	40	-36,001	-61
Between 2 and 4 metres	41,559	39,363	8,139	2,933	-38,626	-5,206
Greater than 4 metres	18,202	55,969	87,562	91,432	73,230	3,870
No data				1,397	1,397	1,397
Total	**95,802**	**95,802**	**95,802**	**95,802**		

Table 11.2: Change in area of piezometric level below natural surface; 12-60 m piezometers; years 2019 to 2020, and years 1998 to 2020

Piezometric Level Below Natural Surface (m)	Years and Area of Piezometric Level (ha)				Change in Area of Piezometric Level (ha) [+ = increasing][- = decreasing]	
	1998	2018	2019	2020	2020 vs 1998	2020 vs 2019
Less than 2 metres	23,024	99	6	0	-23,024	-6
Between 2 and 4 metres	33,481	21,813	2,155	353	-33,128	-1,802
Greater than 4 metres	39,297	73,890	93,641	95,399	56,102	1,758
No data				50	50	50
Total	**95,802**	**95,802**	**95,802**	**95,802**		

Table 11.2 Compares the 12−60 m range in 2020 and demonstrates that the watertable has continued to fall. In 2019 there was 6 ha with a piezometric level within 2 metres of the surface, and in 2020 that figure has dropped to 0 ha.

353 ha or 0.7% of mapped standing water level area existed in the 0-4 m zone in 2020. This area is significantly lower than the 2.3% in 2019.

Figure 11.1:Piezometric level below natural surface; 0-12 m and 12-60 mpiezometers Sep 2020

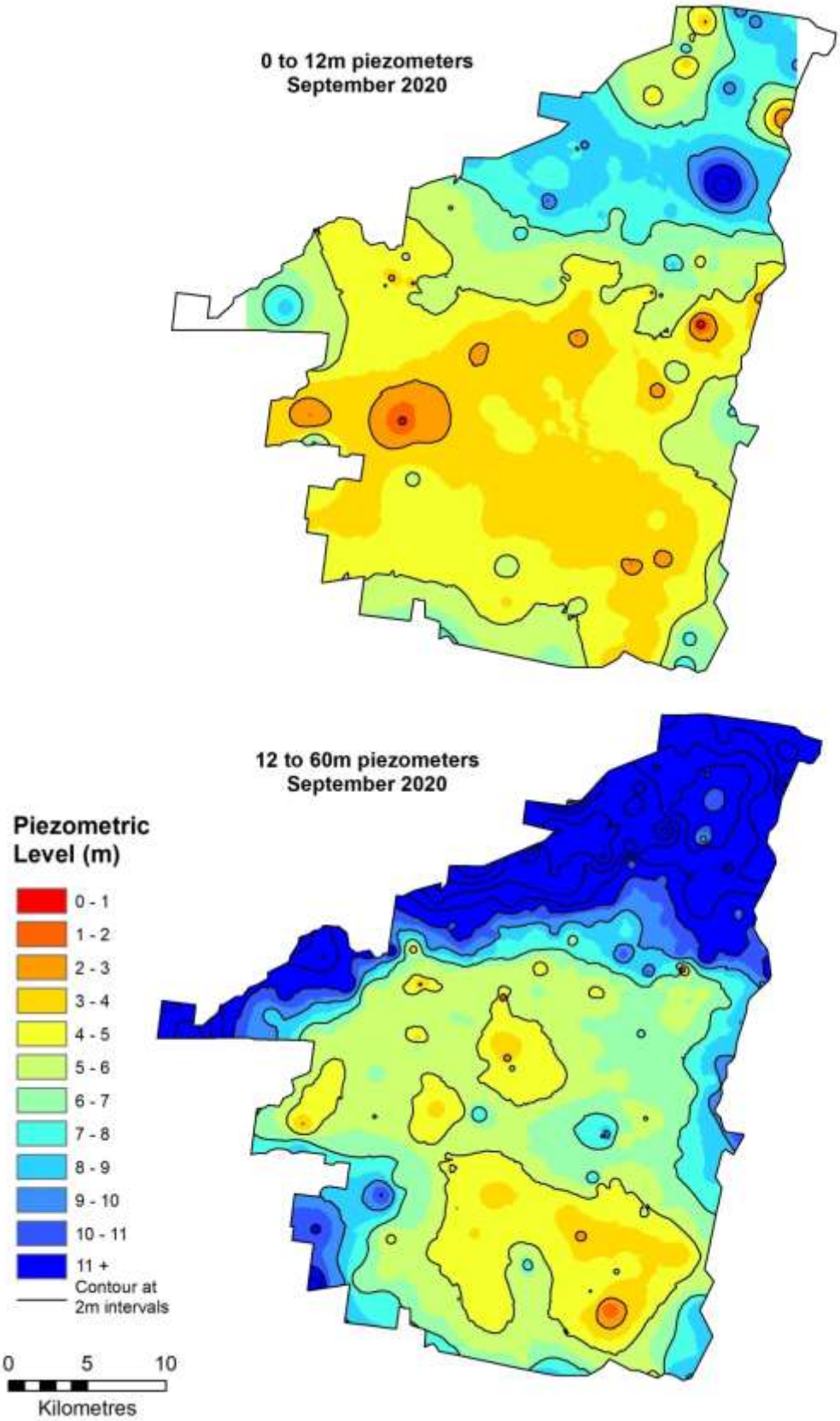


Figure 11.2 depicts the piezometric level below natural surface in September 2020 as converted to the Australian Height Datum (mAHD) and mapped for all of the 0-12 m and 12-60 m piezometers. These are the upper and lower parts of the Shepparton Aquifer, respectively. These levels represent the piezometric level height above sea level and can be used to identify the direction of groundwater flow. In general, the direction of groundwater flow is West-South-West.

Tables 11.3 and 11.4 are tabular representations of Figure 11.2.

Table 11.3: Piezometric level below natural surface; 0-12 m piezometers; Sep 2020 versus Sep 1998

Piezometric Level Below Natural Surface (mAHD)	2020 Area (Ha)	1998 Area (Ha)
123 – 127 (higher)	114	4,151
119 - 122	4,488	39,182
115 - 118	37,213	31,548
111 - 114	44,851	11,211
107 - 110	7,522	5,724
94 – 106 (lower)	217	3,986
No Data	1,397	
Total	**95,802**	**95,802**

Table 11.4: Piezometric level below natural surface; 12-60 m piezometers; Sep 2020 versus Sep 1998

Piezometric Level Below Natural Surface (mAHD)	2020 Area (Ha)	1998 Area (Ha)
123 – 127 (higher)	0	6,381
119 - 122	44	42,337
115 - 118	22,561	34,921
111 - 114	38,259	11,432
107 - 110	21,325	731
94 – 106 (lower)	13,563	0
No Data	50	
Total	**95,802**	**95,802**

Figure 11.2 Piezometric level (mAHD); 0-12 m and 12-60 m piezometers Sept 2020

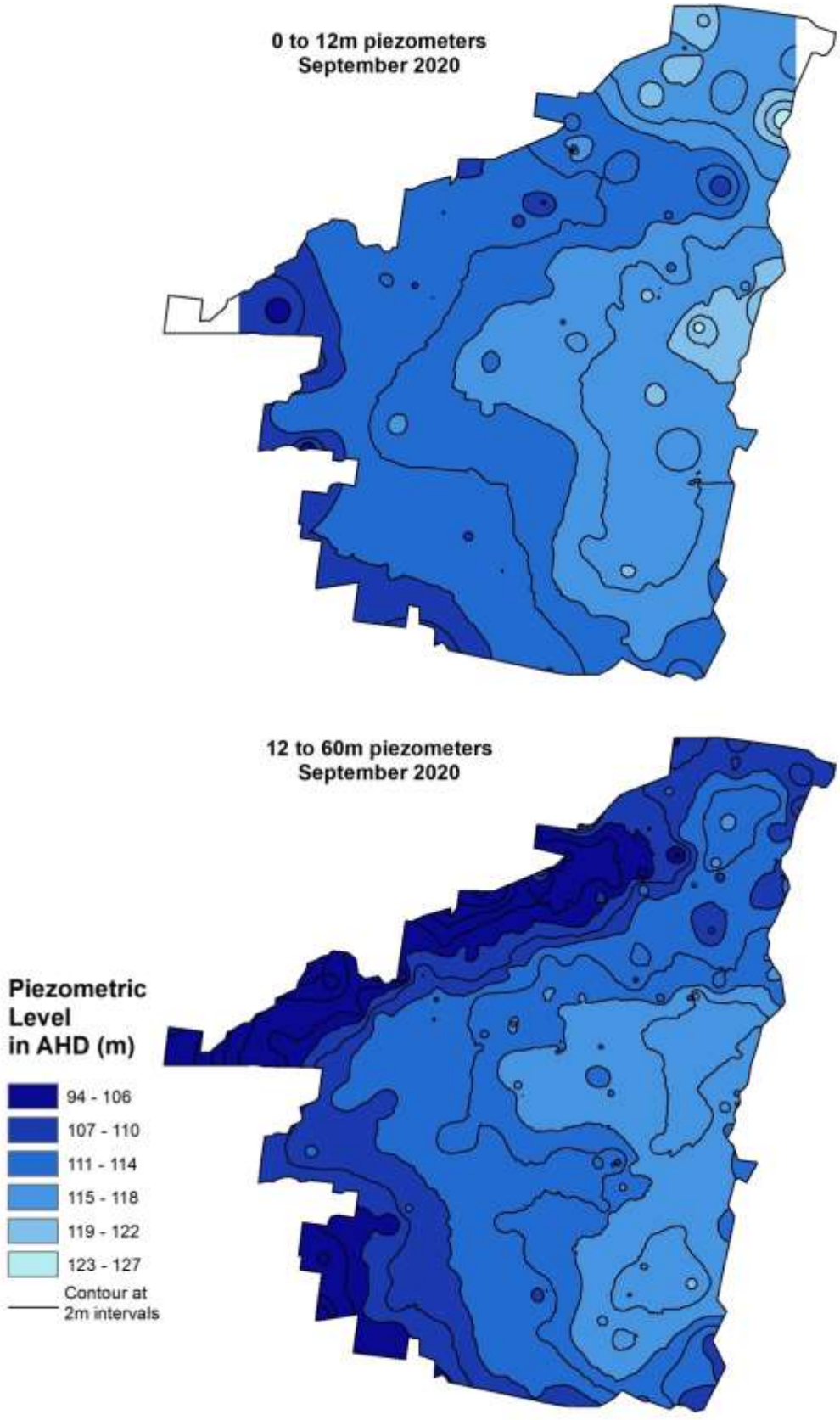
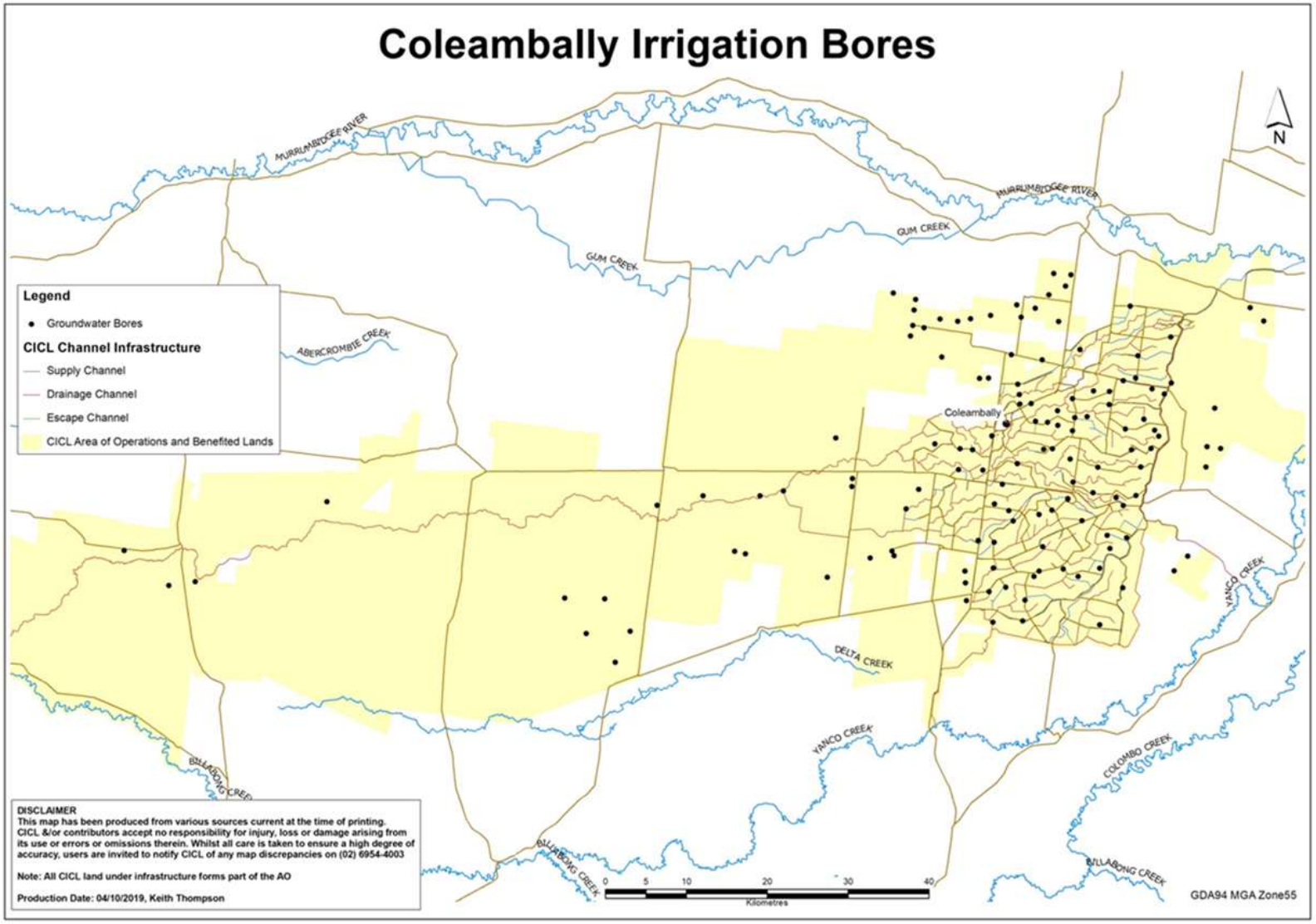


Figure 11.3: Location of irrigation bores with reference to CICL's Area of Operations



11.2 Groundwater Usage

The total metered groundwater usage for the previous three seasons and for the baseline season of 1998/99 is presented in Table 11.5. For the 2019/20 season, the total groundwater extraction within the reporting area was 92,204 ML. It should be noted that in previous seasons all bore sites that were provided by WaterNSW were included in the groundwater extraction figures, however, for the 2019/20 season only those bores which are located within the Area of Operation are included. The number of bores in the area has increased with 52 more licences issued since 2014/15. The overall cap was not breached in 2018/19 and the allocation remained at 100% for the 2019/20 season.

Table 11.5: Groundwater extraction in 2019/20

Area	Number of bore licences (19/20)	Extraction 19/20 (ML)	Extraction 18/19 (ML)	Extraction 17/18 (ML)	Number of bore licences (14/15)	Extraction 98/99 (ML) [baseline]
Coleambally Irrigation Area	74	37,927	41,833	34,423	25	28,714
West Coleambally Channel	22	8,485	11,199	10,805	21	11,065
Coleambally External	41	45,792	57,946	57,763	39	29,161
Total	**137**	**92,204**	**110,978**	**102,991**	**85**	**68,940**

12.1 Water Quality

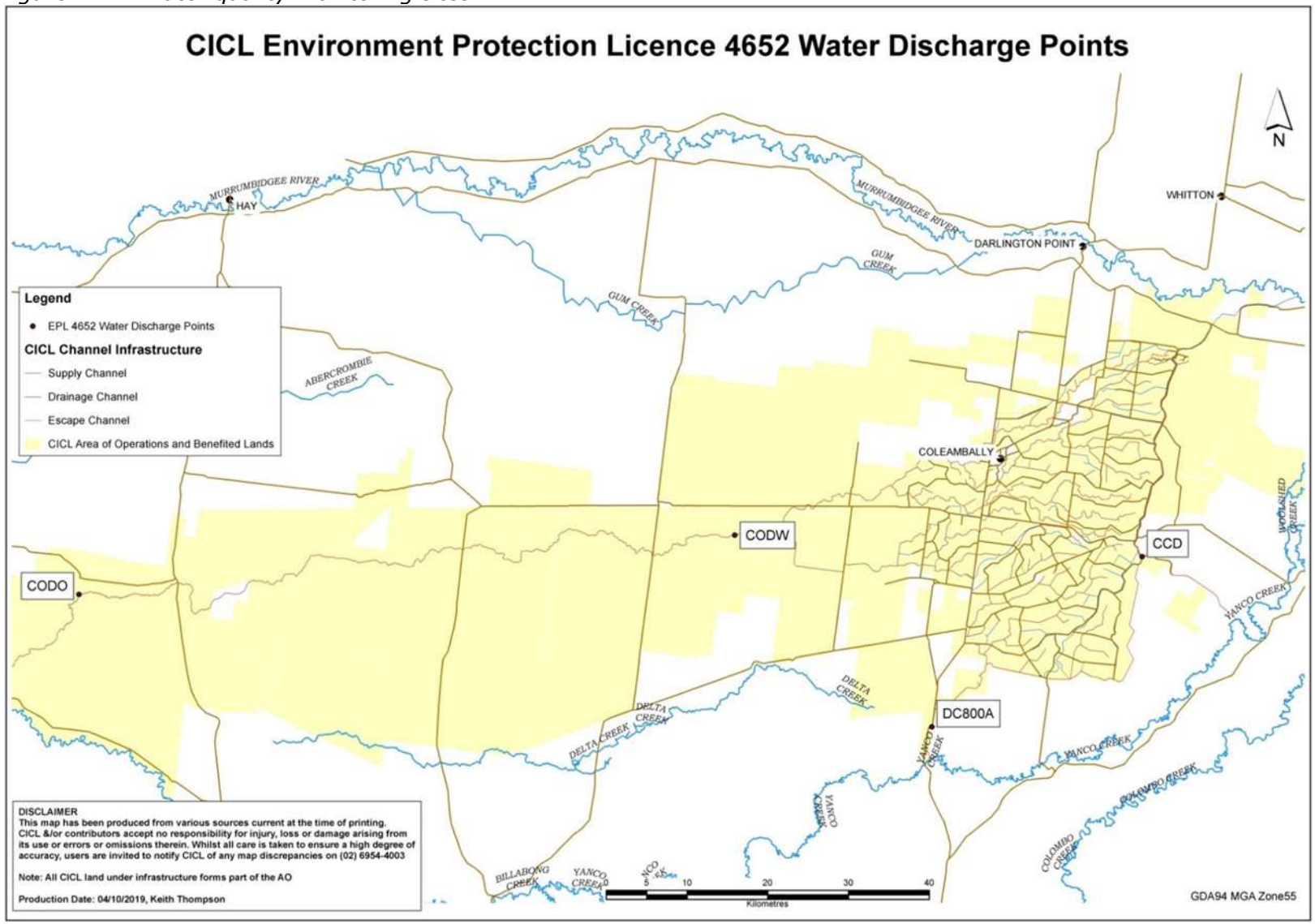
CICL's surface water quality program is aimed at monitoring supply and drainage water quality within CICL's operational area, including at the licensed discharge points. The program monitors flow, turbidity, dissolved oxygen, pH, EC, chemical and nutrient levels at various points to comply with licence conditions. CICL's water quality monitoring sites are shown in Figure 12.1.

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. Water samples are also collected and analysed from one supply site at the Main Canal Off-take when flowing. An EC sensor is installed at the Main Canal Off-take to provide data used to calculate the salt load.

For the 2019/20 season a total of two water samples were taken and analysed to meet the requirements of M2.2 of the Environment Protection Licence (see Appendices). Neither of the samples returned results that exceeded either the Notification or Action levels stipulated in Schedule 1 of the Environment Protection Licence.

In analysing the flows reported at the site CODWonga (see Table 8.8) and comparing them against the supply water released from the Boona and Argoon Escapes (see Table 8.10) it has been determined that a portion of the water reported for the month of April 2020 was not supply water. In March and April 2020 a total volume of 2,551 ML was released from the Argoon escape (with no volume released from the Boona escape). This release was a planned G class event to meet the requirements of our members with pumping sites along the West Coleambally Channel. Over this same time period a total volume of 2,775 ML was reported at the CODWonga site, or 224 ML in excess of the volume of supply water released from the Argoon escape. It is believed that due to the high rainfall conditions experienced in the few months up until April 2020 the West Coleambally Channel retained water in pools along the drain, which contributed to the total volume metered at the CODWonga site. Nevertheless as a portion of this flow could be considered an unplanned discharge under the Environment Protection Licence, monthly water quality testing should have been undertaken for the month of April. In future monthly water quality testing will be undertaken at the CODWonga and DC800A (410108) site whenever there is a reported flow through the respective meters.

Figure 12.1: Water quality monitoring sites



12.2 Environmental Monitoring

This section is in response to condition M4 of the EPL 4652.

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. During the program on one occasion there was flow to sample sites. The related results are in Table 12.1.

Table 12.1 Environmental monitoring licence point results in 2019/20

Date	CODWonga Molinate (µg/L)	DC800A Molinate (µg/L)	CCD Molinate (µg/L)	Report No.
Week 1	NF	NS	NF	
Week 2	NF	<0.005	NF	ES1934959
Week 3	NS	NS	NF	
Week 4	NS	NS	NF	
Week 4	NS	NS	NF	
Week 5	NS	NS	NF	
Week 6	NF	NS	NF	
Week 7	NF	NS	NF	
Week 8	NF	NS	NF	
Week 9	NF	NS	NF	

Note:NF = No Flow, NS = Not Sampled - Supply Water Flow Only, NR = No Result

12.3 Chemical Use

In absolute terms chemical usage by CICL is down this season compared to last season. This is due to cycling pesticide use to alleviate growing resistance, drier seasons leading to less weeds and utilising alternative controls.

Table 12.2: CICL chemical usage in 2019/20

Product	Active Constituent	Litres or Kg	Application
Access	Triclopr, Picloram	91	Boxthorns
Bowlem	Canola Oil, Ammonia Sulfate	1,379	Spray adjuvant
Cutlass	Dicamba	775	Weed grass control
Dalapon	2-2-DPA	304	Cumbungi, water couch
Diesel		5,430	Spray adjuvant
Grazon	Triclopr, Picloram	38	Brush weeds
Roundup	Glyphosphate	1,761	Weed control
Starane	Fluroxypr-meptyl	5	Weed control
Sulfomac	Sulfonylurea	2,022	Weeds around structures
Tordon	Picloram	83	Woody weeds
VC700	Propionic Acid, Soyal Phospholipids	146	Spray adjuvant

12.4 Reportable Incidents

There were no reportable water quality incidents in 2019/20 where a chemical exceeded notifiable levels as part of routine monitoring.

There was one vehicular accident involving third parties where a truck carrying poultry manure drove into a supply channel. The Pollution Incident Response Management Plan was activated and the site was managed for potential pollutants in consultation with the EPA. No pollutants exceeded notifiable levels.

In March 2020 water samples returned a positive result for Blue Green Algae, with a high biovolume measurement exceeding the Red Alert level category for recreational purposes. The pool of water was isolated from the rest of the system, with all potentially affected landholders notified. The test results were reported to WaterNSW.