



Murray Irrigation

Annual Compliance Report

2015/16

31 October 2016

All the data presented in the Annual Compliance Report is available in electronic format by contacting:

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1 PREFACE

The Annual Compliance Report 2015/16 is written to meet the reporting requirements of the licences Murray Irrigation holds with NSW DPI Water and the NSW Environment Protection Authority (EPA). NSW DPI Water administers the two Combined Water Supply Work Approval and Water Use Approvals (50CA501687 and 50CA512282). The EPA administers the Environment Protection Licence (5014).

1.1 Statement of Compliance

Murray Irrigation considers it has complied with all the conditions in the Combined Water Supply Work Approval and Water Use Approval (50CA501687), dated 10 October 2013.

Murray Irrigation considers it has complied with all the conditions in the Combined Water Supply Work Approval and Water Use Approval for salinity and watertable management tube-wells (50CA512282), dated 10 October 2013.

Murray Irrigation did not change or modify the condition of the authorised water supply works listed in the Combined Water Supply Work Approval and Water Use Approval (50CA501687) during 2015/16.

Murray Irrigation did not change or modify the condition of the existing authorised discharge works listed in the Combined Water Supply Work Approval and Water Use Approval (50CA501687) or construct new works that discharge from the Area of Operations during 2015/16.

Murray Irrigation did not change or modify the condition of the existing authorised discharge works listed in the Combined Water Supply Work Approval and Water Use Approval for salinity and watertable management tube-wells (50CA5012282) during 2015/16.

2 PLAN OF OPERATIONS AND WORKS

The Murray Irrigation Area of Operations Authorised Water Supply Works and supply system is presented in Figure 1. It also identifies the location of the supply channel escape discharge sites and the flood control works. Figure 2 presents the stormwater escape system and identifies the location of discharge monitoring sites from the stormwater escape system. It also identifies the location of the Wakool Tullakool Sub-Surface Drainage Scheme (WTSSDS).

2.1 Operational Background

Murray Irrigation extracts water from two Authorised Water Supply Works:

- Mulwala Canal Offtake from the Murray River at Lake Mulwala
- Wakool Canal Offtake from the Colligen Creek from the Edwards River

The Mulwala Canal supplies water to the area east of the Edward River (formerly known as the Berriquin and Denimein Irrigation Districts) and the area west of the Edward River and south of the Wakool River (formerly known as the Deniboota Irrigation District). Lawson's Syphon enables the Mulwala Canal to supply water to the area west of the Edward River. The Wakool Canal supplies water to the area north of the Wakool River and south of the Edward River (formerly known as the Wakool Irrigation District and Tullakool Irrigation Area).

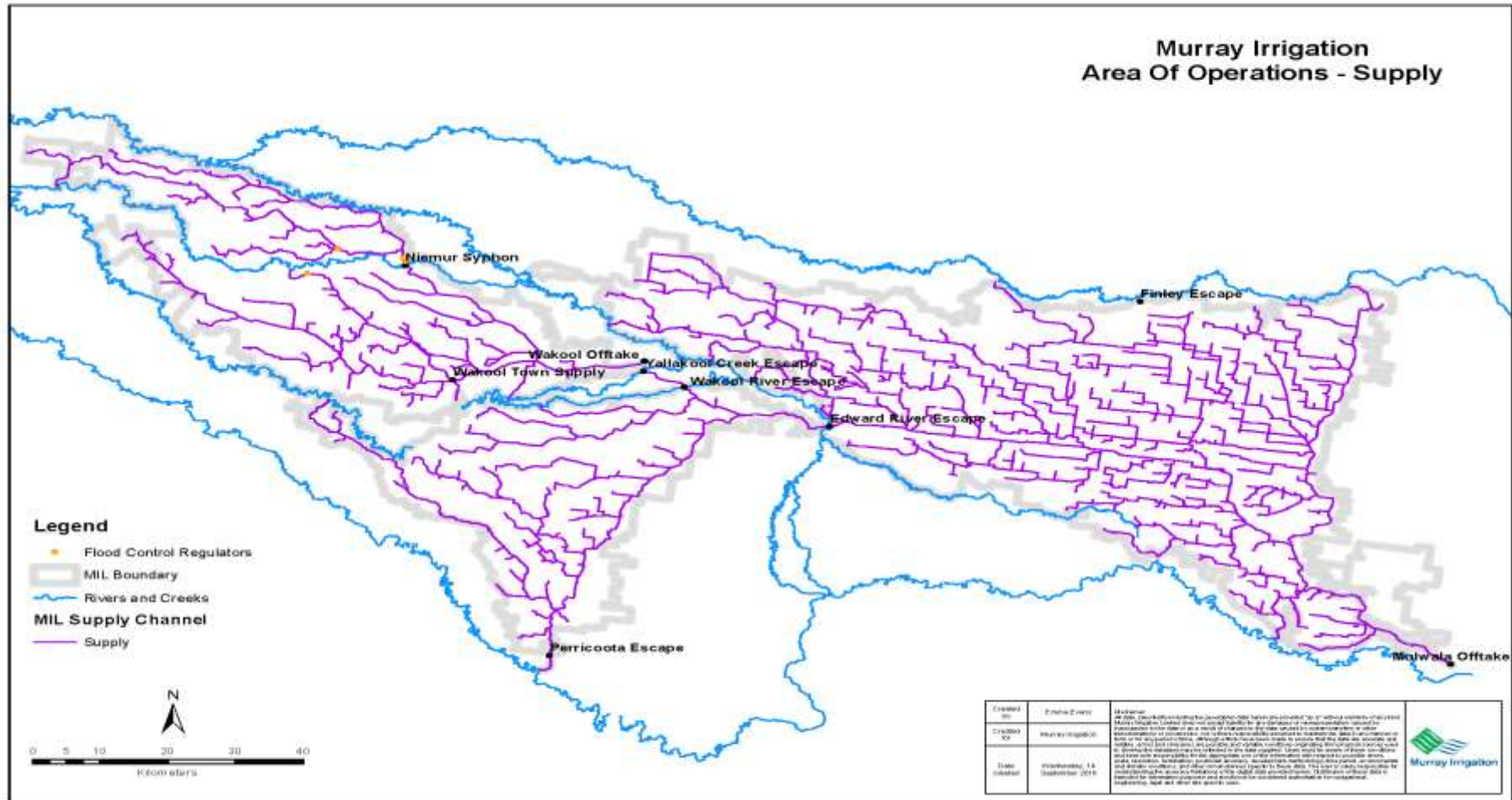
Murray Irrigation has an agreement with Water NSW to convey water through the Murray Irrigation supply channel system on its behalf. The authorised works used to convey water on behalf of Water NSW are referred to as supply channel escape discharge sites.

Finley Escape: BIFE (409077)

The Finley Escape (BIFE) has a dual role. The Finley Escape primarily acts as a supply channel escape discharge site, but it also has a role as a stormwater discharge site.

The Finley Escape is listed in the Approval as a supply channel escape discharge site in Schedule 1 – Attachment 2 and the Environment Protection Licence lists the Finley Escape as a licensed discharge point. The Finley Escape (BIFE) is identified on both the supply and drainage Area of Operations maps.

Figure 1: Area of Operations: supply



2.2 Inclusion/Exclusion of lands from the Area of Operations

The lands published in the NSW Government Gazette for exclusion from Murray Irrigation's Area of Operations are presented in Table 1.

Table 1: Exclusions of land from the Area of Operations

Date of NSW Government Gazette	Land details of exclusions
<p style="text-align: center;">Number 7 Friday, 5 February 2016</p>	<p>Lot 1 DP 756590, Parish of Wandaradget, County of Wakool Lot 38 DP 756590, Parish of Wandaradget, County of Wakool Lot 59 DP 756590, Parish of Wandaradget, County of Wakool Lot 62 DP 756590, Parish of Wandaradget, County of Wakool Lot 63 DP 756590, Parish of Wandaradget, County of Wakool Lot 64 DP 756590, Parish of Wandaradget, County of Wakool Lot 65 DP 756590, Parish of Wandaradget, County of Wakool</p>
	<p>Lot 24 DP 756600, Parish of Yadchow, County of Wakool</p>
	<p>Lot 23 DP 756590, Parish of Wandaradget, County of Wakool Lot 24 DP 756590, Parish of Wandaradget, County of Wakool Lot 51 DP 756590, Parish of Wandaradget, County of Wakool Lot 54 DP 756590, Parish of Wandaradget, County of Wakool</p>
	<p>Lot 37 DP 756533, Parish of Cunninyeuk, County of Wakool Lot 43 DP 756533, Parish of Cunninyeuk, County of Wakool Lot 49 DP 756533, Parish of Cunninyeuk, County of Wakool</p>
	<p>Lot 86 DP 756568, Parish of Niemur, County of Wakool</p>
	<p>Lot 23 DP 756600, Parish of Yadchow, County of Wakool</p>
	<p>Lot 37 DP 756587, Parish of Towweruk, County of Wakool</p>
	<p>Lot 3 DP 217307, Parish of Towweruk, County of Wakool</p>
	<p>Lot 68 DP 756590, Parish of Wandaradget, County of Wakool</p>
	<p>Lot 85 DP 756568, Parish of Niemur, County of Wakool Lot 87 DP 756568, Parish of Niemur, County of Wakool</p>
	<p>Lot 69 DP 756590, Parish of Wandaradget, County of Wakool</p>
	<p>Lot 17 DP 756569, Parish of Noorong, County of Wakool</p>
	<p>Lot 1 DP 1106588, Parish of Noorong, County of Wakool</p>
	<p>Lot 1 DP 129621, Parish of Noorong, County of Wakool Lot 2 DP 129621, Parish of Noorong, County of Wakool</p>
	<p>Lot 19 DP 756553, Parish of Mallan, County of Wakool Lot 77 DP 756553, Parish of Mallan, County of Wakool</p>
	<p>Lot 54 DP 756533, Parish of Cunninyeuk, County of Wakool</p>
	<p>Lot 35 DP 756587, Parish of Towweruk, County of Wakool</p>
	<p>Lot 3 DP 114912, Parish of Towweruk, County of Wakool</p>
	<p>Lot 2 DP 217307, Parish of Towweruk, County of Wakool</p>

	<p>Lot 2 DP 528296, Parish of Towweruk, County of Wakool</p> <p>Lot 78 DP 756553, Parish of Mallan, County of Wakool Lot 79 DP 756553, Parish of Mallan, County of Wakool</p> <p>Lot 7 DP 756600, Parish of Yadchow, County of Wakool Lot 105 DP 756600, Parish of Yadchow, County of Wakool Lot 106 DP 756600, Parish of Yadchow, County of Wakool Lot 113 DP 756600, Parish of Yadchow, County of Wakool Lot 114 DP 756600, Parish of Yadchow, County of Wakool Lot 115 DP 756600, Parish of Yadchow, County of Wakool Lot 116 DP 756600, Parish of Yadchow, County of Wakool Lot 121 DP 756600, Parish of Yadchow, County of Wakool Lot 133 DP 756600, Parish of Yadchow, County of Wakool Lot 134 DP 756600, Parish of Yadchow, County of Wakool</p> <p>Lot A DP 926022, Parish of Yadchow, County of Wakool Lot B DP 926022, Parish of Yadchow, County of Wakool</p> <p>Lot 1 DP 1119802, Parish of Yadchow, County of Wakool Lot 2 DP 1119802, Parish of Yadchow, County of Wakool Lot 3 DP 1119802, Parish of Yadchow, County of Wakool</p> <p>Lot 1 DP 756600, Parish of Yadchow, County of Wakool Lot 2 DP 756600, Parish of Yadchow, County of Wakool Lot 3 DP 756600, Parish of Yadchow, County of Wakool Lot 6 DP 756600, Parish of Yadchow, County of Wakool Lot 14 DP 756600, Parish of Yadchow, County of Wakool Lot 15 DP 756600, Parish of Yadchow, County of Wakool Lot 19 DP 756600, Parish of Yadchow, County of Wakool Lot 20 DP 756600, Parish of Yadchow, County of Wakool Lot 21 DP 756600, Parish of Yadchow, County of Wakool Lot 25 DP 756600, Parish of Yadchow, County of Wakool Lot 26 DP 756600, Parish of Yadchow, County of Wakool Lot 101 DP 756600, Parish of Yadchow, County of Wakool Lot 102 DP 756600, Parish of Yadchow, County of Wakool Lot 103 DP 756600, Parish of Yadchow, County of Wakool Lot 104 DP 756600, Parish of Yadchow, County of Wakool</p> <p>Lot 8 DP 756602, Parish of Yarrien, County of Wakool Lot 9 DP 756602, Parish of Yarrien, County of Wakool</p> <p>Lot 10 DP 756602, Parish of Liewa, County of Wakool Lot 11 DP 756602, Parish of Liewa, County of Wakool Lot 12 DP 756602, Parish of Liewa, County of Wakool Lot 16 DP 756602, Parish of Liewa, County of Wakool Lot 17 DP 756602, Parish of Liewa, County of Wakool Lot 18 DP 756602, Parish of Liewa, County of Wakool</p> <p>Lot 19 DP 756602, Parish of Yarrien, County of Wakool</p> <p>Lot 23 DP 756602, Parish of Liewa, County of Wakool Lot 24 DP 756602, Parish of Liewa, County of Wakool Lot 25 DP 756602, Parish of Liewa, County of Wakool Lot 26 DP 756602, Parish of Liewa, County of Wakool</p> <p>Lot 27 DP 756602, Parish of Yarrien, County of Wakool</p> <p>Lot 28 DP 756602, Parish of Liewa, County of Wakool Lot 33 DP 756602, Parish of Liewa, County of Wakool</p> <p>Lot 55 DP 756602, Parish of Yarrein, County of Wakool Lot 56 DP 756602, Parish of Yarrein, County of Wakool Lot 59 DP 756602, Parish of Yarrein, County of Wakool</p>
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	<p>Lot 60 DP 756602, Parish of Yarrein, County of Wakool</p> <p>Lot 111 DP 756602, Parish of Yarrein, County of Wakool</p> <p>Lot 125 DP 756602, Parish of Liewa, County of Wakool Lot 126 DP 756602, Parish of Liewa, County of Wakool Lot 127 DP 756602, Parish of Liewa, County of Wakool Lot 129 DP 756602, Parish of Liewa, County of Wakool Lot 130 DP 756602, Parish of Liewa, County of Wakool Lot 131 DP 756602, Parish of Liewa, County of Wakool Lot 152 DP 756602, Parish of Liewa, County of Wakool Lot 153 DP 756602, Parish of Liewa, County of Wakool Lot 154 DP 756602, Parish of Liewa, County of Wakool</p> <p>Lot 6 DP 40687, Parish of Niemur, County of Wakool Lot 7 DP 40687, Parish of Niemur, County of Wakool Lot 8 DP 40687, Parish of Niemur, County of Wakool</p> <p>Lot 2 DP 42536, Parish of Niemur, County of Wakool</p> <p>Lot 63 DP 756568, Parish of Niemur, County of Wakool Lot 72 DP 756568, Parish of Niemur, County of Wakool</p> <p>Lot 53 DP 756533, Parish of Cunninyeuk, County of Wakool</p> <p>Lot 90 DP 756568, Parish of Niemur, County of Wakool</p> <p>Lot 94 DP 40639, Parish of Niemur, County of Wakool</p> <p>Lot 83 DP 40640, Parish of Mallan, County of Wakool</p> <p>Lot 16 DP 756553, Parish of Mallan, County of Wakool Lot 17 DP 756553, Parish of Mallan, County of Wakool Lot 22 DP 756553, Parish of Mallan, County of Wakool Lot 53 DP 756553, Parish of Mallan, County of Wakool Lot 54 DP 756553, Parish of Mallan, County of Wakool Lot 63 DP 756553, Parish of Mallan, County of Wakool Lot 65 DP 756553, Parish of Mallan, County of Wakool Lot 69 DP 756553, Parish of Mallan, County of Wakool Lot 71 DP 756553, Parish of Mallan, County of Wakool</p>
<p>Number 35 Friday 13 May 2016</p>	<p>Lot 1 DP 384773, Parish of Yadchow, County of Wakool</p> <p>Lot 108 DP 756600, Parish of Yadchow, County of Wakool Lot 109 DP 756600, Parish of Yadchow, County of Wakool Lot 110 DP 756600, Parish of Yadchow, County of Wakool Lot 111 DP 756600, Parish of Yadchow, County of Wakool Lot 112 DP 756600, Parish of Yadchow, County of Wakool Lot 117 DP 756600, Parish of Yadchow, County of Wakool</p> <p>Lot 107 DP 659056, Parish of Yadchow, County of Wakool Lot 20 DP 756553, Parish of Mallan, County of Wakool Lot 40 DP 756553, Parish of Mallan, County of Wakool Lot 41 DP 756553, Parish of Mallan, County of Wakool Lot 82 DP 756553, Parish of Mallan, County of Wakool</p> <p>Lot 3 DP 1098659, Parish of Mallan, County of Wakool</p> <p>Lot 118 DP 756600, Parish of Yadchow, County of Wakool Lot 147 DP 756600, Parish of Yadchow, County of Wakool Lot 148 DP 756600, Parish of Yadchow, County of Wakool Lot 17 DP 756600, Parish of Yadchow, County of Wakool</p>

	<p>Lot 2 DP 543808, Parish of Yadchow, County of Wakool</p> <p>Lot 2 DP 543809, Parish of Yadchow, County of Wakool</p> <p>Lot 34 DP 756553, Parish of Mallan, County of Wakool Lot 35 DP 756553, Parish of Mallan, County of Wakool Lot 36 DP 756553, Parish of Mallan, County of Wakool Lot 42 DP 756553, Parish of Mallan, County of Wakool Lot 43 DP 756553, Parish of Mallan, County of Wakool</p> <p>Lot 2 DP 543810, Parish of Yadchow, County of Wakool</p> <p>Lot 37 DP 756553, Parish of Mallan, County of Wakool</p> <p>Lot 1 DP 1098659, Parish of Mallan, County of Wakool Lot 2 DP 1098659, Parish of Mallan, County of Wakool</p> <p>Lot 38 DP 756553, Parish of Mallan, County of Wakool Lot 39 DP 756553, Parish of Mallan, County of Wakool</p> <p>Lot 1 DP 1046310, Parish of Niemur, County of Wakool</p> <p>Lot 1 DP 1046324, Parish of Niemur, County of Wakool</p> <p>Lot 14 DP 756276, Parish of Devon, County of Townsend</p> <p>Lot 121 DP 721998, Parish of Banangalite, County of Townsend</p> <p>Lot 15 DP 756245, Parish of Banangalite, County of Townsend Lot 39 DP 756245, Parish of Banangalite, County of Townsend Lot 45 DP 756245, Parish of Banangalite, County of Townsend Lot 46 DP 756245, Parish of Banangalite, County of Townsend Lot 47 DP 756245, Parish of Banangalite, County of Townsend Lot 48 DP 756245, Parish of Banangalite, County of Townsend Lot 49 DP 756245, Parish of Banangalite, County of Townsend Lot 50 DP 756245, Parish of Banangalite, County of Townsend Lot 51 DP 756245, Parish of Banangalite, County of Townsend Lot 86 DP 756245, Parish of Banangalite, County of Townsend</p> <p>Lot 120 DP 721998, Parish of Banangalite, County of Townsend</p> <p>Lot 11 DP 756276, Parish of Devon, County of Townsend Lot 12 DP 756276, Parish of Devon, County of Townsend Lot 13 DP 756276, Parish of Devon, County of Townsend Lot 15 DP 756276, Parish of Devon, County of Townsend Lot 16 DP 756276, Parish of Devon, County of Townsend Lot 17 DP 756276, Parish of Devon, County of Townsend Lot 18 DP 756276, Parish of Devon, County of Townsend Lot 19 DP 756276, Parish of Devon, County of Townsend</p> <p>Lot 6 DP 756298, Parish of Morago, County of Townsend Lot 7 DP 756298, Parish of Morago, County of Townsend Lot 9 DP 756298, Parish of Morago, County of Townsend Lot 38 DP 756298, Parish of Morago, County of Townsend Lot 57 DP 756298, Parish of Morago, County of Townsend</p> <p>Lot 58 DP 756298, Parish of Morago, County of Townsend</p> <p>Lot 34 DP 1043773, Parish of Colimo, County of Townsend</p>
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3 SUMMARY

The climatic conditions in the area influence every aspect of this report. The climate determines the volume of water available for irrigation, the volume of water used for irrigation, the volume of water discharged from the area and the rate of evaporation.

The water allocation for the New South Wales Murray and Lower Darling Water Sharing Plan was 23% for general security water entitlements in 2015/16. The low allocation is reflected in the large decrease in the volume of water delivered on farm compared to 2014/15. The crop type water use on-farm highlights the impact of a low general security allocation on the water use decision by Murray Irrigation customers with 30% of water orders for cereal (winter crops), 31% of water orders for annual pasture and 11% of water orders for rice.

Murray Irrigation's delivery efficiency was 87%.

Murray Irrigation delivered water on behalf of the NSW Office of Environment and Heritage (OEH) for environmental purposes. The water was transferred onto Murray Irrigation's general security water access licence and delivered through customer outlets and supply channel escapes. The water was used to supply environment flows to the Tuppal Creek and Yarrein Creeks.

The flows in the drainage system during 2015/16 were lower than previous years, reflecting different rainfall patterns and reduced runoff following rainfall.

The area within the Murray Irrigation Area of Operations affected by watertable within two metres of the surface decreased to 2,442ha in August 2015, but the area affected remains small (1% of the Area of Operations). The area affected by watertable within four metres of the surface decreased and remains at historic low levels (8% of the Area of Operations). This is a reflection of the drier winter in recent years and the lower on-farm water usage in 2015/16.

In 2016, the major blue-green algae bloom at red alert levels in the Murray River system (to Mildura) resulted in the entire Murray Irrigation supply system being placed on red alert levels for blue-green algae from 23 February 2016 to 16 May 2016.

4 CLIMATIC CONDITIONS

The climatic data for the Murray Irrigation Area of Operations is monitored at two weather stations operated by the CSIRO in Finley and Tullakool. These stations measure rainfall and evapotranspiration on a daily basis. A summary of the yearly data for July 2015 to June 2016 is presented in Table 2. The monthly data is presented in Figure 3 and Figure 4.

Table 2: Summary of Climatic Data (July 2015 – June 2016)

	Total rainfall (mm)	Average rainfall (mm)	%	Total evapotranspiration (mm)	Average evapotranspiration (mm)	%	Long term data
Finley	367.0	377.4	97	1,860.9	1,883.3	99	1986 - 2015
Tullakool	241.2	326.7	74	2,059.6	2,033.7	101	1997 - 2015

Figure 3: Climatic Data: Finley

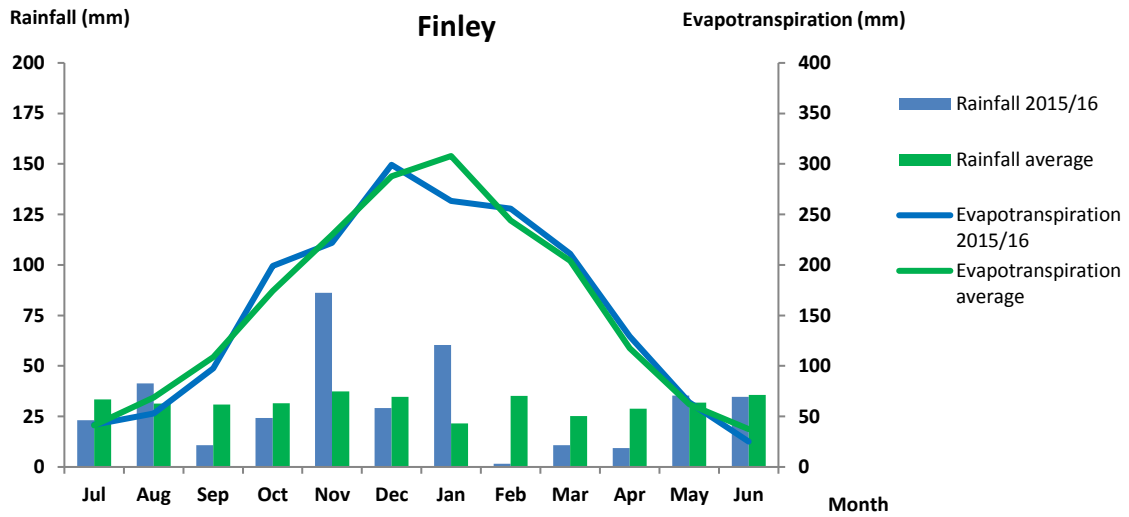
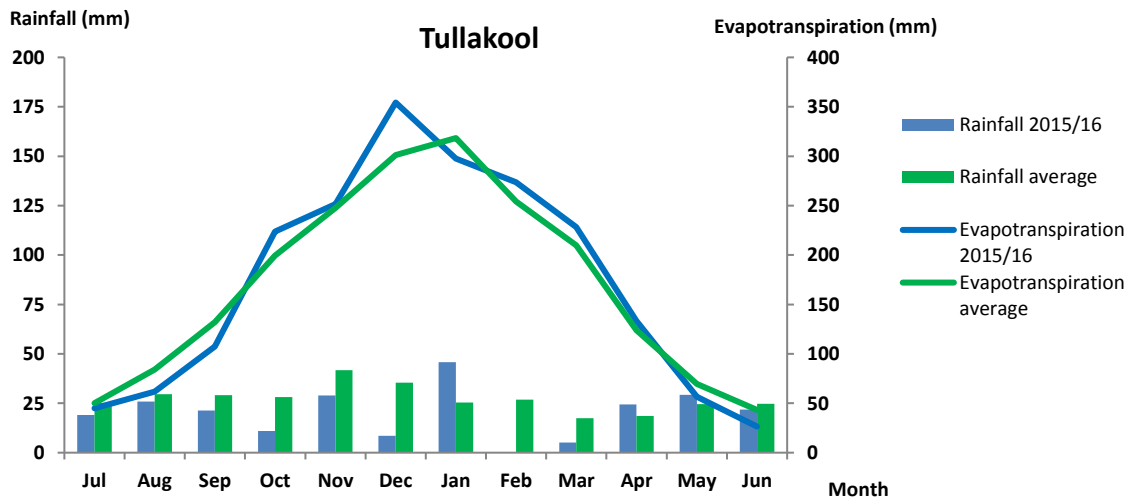


Figure 4: Climatic Data: Tullakool



5 NEW MEASURES TO LIMIT GROUNDWATER RECHARGE AND DISCHARGE OF SALT

On 1 July 2013, Murray Irrigation introduced a new Environment Policy that combined the previous Rice Growing Policy, Total Farm Water Balance Policy and Stormwater Disposal Policy into one policy. The implementation of the Environment Policy assists Murray Irrigation in limiting groundwater recharge within the Murray Irrigation Area of Operations and the discharge of salt downstream from the Murray Irrigation Area of Operations.

6 REPORTING ON WATER MANAGEMENT

6.1 Water Allocation and Extraction

6.1.1 Water Allocation

The water allocation for the New South Wales Murray and Lower Darling Regulated Rivers Water Source is presented in Table 3.

Table 3: Water allocation (%)

Year	General Security Water Allocation (%)
2015/16	23
2014/15	61
2013/14	100
2009/10	27

6.1.2 Extraction

The volume of water extracted by Murray Irrigation under its Water Access Licences (WAL) is summarised in Table 4.

Table 4: Water Access Licence Extraction (ML)

Licence No.	Water Access Licence category	Volume extracted (ML)
50AL503817	Regulated River – General Security	234,938
50AL503532	Regulated River – Conveyance	175,058
50AL503529	Regulated River – High Security	114
50AL503530	Regulated River – High Security (town supply)	3170
50AL503533	Supplementary Water	0
TOTAL (2015/16)		413,280

The volume of water extracted at the Authorised Water Supply Works is summarised in Table 5. The table includes extractions under agreement with State Water.

Table 5: Extraction Volume 2014/15 (ML)

	Extractions (diversions)						Credits (Transmission loss credits) (ML)	Net extractions under licence (ML)
	Mulwala Canal Offtake extractions (licence) (ML)	Wakool Canal Offtake extractions (licence) (ML)	Floodway extractions (licence) (ML)	Total Extractions under licence (ML)	Extraction supply channel escapes under agreement (ML)	Total Extractions under licence and under agreement (ML)		
	A	B	C	A+B+C	D	A+B+C+D	E	A+B+C-E
Jul 15	3,450	0	0	3,450	0	3,450	0	3,450
Aug 15	18,622	5,312	0	23,934	5,734	29,668	148	23,786
Sep 15	62,976	13,077	0	76,053	4,675	80,727	64	75,989
Oct 15	61,369	11,757	0	73,126	22,422	95,548	848	72,278
Nov 15	18,251	4,088	0	22,339	24,471	46,810	1,682	20,657
Dec 15	28,960	6,718	0	35,678	54,920	90,598	4,316	31,362
Jan 16	24,610	6,662	0	31,272	53,480	84,752	4,328	26,944
Feb 16	26,015	5,840	0	31,855	35,715	67,570	2,738	29,117
Mar 16	53,215	16,018	0	69,233	18,795	88,028	597	68,636
Apr 16	55,241	15,098	0	70,339	7,562	77,901	6	70,333
May 16	-9,812	553	0	-9,259	16,100	6,841	14	-9,273
Jun 16	0	0	0	0	0	0	0	0
TOTAL 15/16	342,897	85,123	0	428,020	243,874	671,894	14,741	413,279

A comparison of the total extractions compared to previous years is presented in Table 6.

Table 6: Total extractions compared to previous years (ML)

Year	Extracted under licence (ML)	Extracted under agreement (ML)	Total extracted (ML)
2015/16	428,020	243,874	671,894
2014/15	881,556	472,971	1,354,527
2013/14	1,131,767	190,775	1,322,542
2009/10	278,604	194,428	473,032

6.2 Deliveries

6.2.1 Deliveries to customers on-farm

The volume of water delivered to Murray Irrigation customers' on-farm is summarised in Table 7.

Table 7: Deliveries to customers on-farm: 2015/16 (ML)

	Mulwala Canal Offtake (ML)	Wakool Canal Offtake (ML)	Total deliveries to customers on-farm (ML)
Jul 15	90	19	109
Aug 15	713	258	971
Sep 15	48,401	10,075	58,476
Oct 15	51,439	10,025	61,464
Nov 15	12,245	2,442	14,687
Dec 15	22,286	3,799	26,085
Jan 16	20,178	3,505	23,683
Feb 16	16,582	2,372	18,954
Mar 16	44,143	11,922	56,065
Apr 16	50,833	12,784	63,617
May 16	10,328	4,341	14,669
Jun 16	107	11	118
TOTAL 15/16	277,345	61,553	338,898

A comparison of the total volume delivered on-farm compared to previous years is presented in Table 8.

Table 8: On-farm deliveries compared to previous years (ML)

Year	On-farm deliveries (ML)
2015/16	338,898
2014/15	739,010
2013/14	924,570
2009/10	161,473

6.2.2 Deliveries for environmental purposes

Murray Irrigation delivered water for environmental purposes on behalf of the NSW Office of Environment and Heritage (OEH). OEH transferred the water onto Murray Irrigation's General Security Water Access Licence for delivery via customer outlets or supply channel escapes.

The environmental water delivered via customer outlets was arranged by OEH and the individual customers. The volume of water delivered was recorded in the water ordering system as 'wetlands water'. Refer to section 5.4 Water Use.

Environmental water delivered using Murray Irrigation's supply channel escapes is presented in Table 9.

Table 9: Delivery of environmental water via channel supply escapes (ML)

Supply Channel Escape	Tocumwal Escape (ML)	Northern 7 Extension Escape (ML)	Northern 8 Escape (ML)	Northern Branch Escape (ML)	Mallan Escape (ML)	Total environmental water delivered via supply channel escapes (ML)
Receiving waters	Tuppal Creek	Yarrein Creek				
Jul 15	0	0	0	0	0	0
Aug 15	0	0	0	0	0	0
Sep 15	6369	140	280	80	160	1,299
Oct 15	1,659	280	520	500	879	3,838
Nov 15	1,584	0	0	161	30	1,775
Dec 15	0	0	0	0	0	0
Jan 16	0	0	0	0	0	0
Feb 16	0	0	0	0	0	0
Mar 16	0	0	0	0	0	0
Apr 16	0	0	0	0	0	0
May 16	0	0	0	0	0	0
Jun 16	0	0	0	0	0	0
TOTAL 15/16	3,882	420	800	741	1,069	6,912

6.3 Discharges

6.3.1 Discharges from supply channel escapes under agreement

The volume of water discharged through the supply channel escape discharge sites under agreement is presented in Table 11.

A comparison of the supply channel escape discharge sites under agreement compared to previous years is presented in Table 10.

Table 10: Total discharges from supply channel escapes under agreement for 2015/16 compared to previous years (ML)

Year	Discharges from supply channel escapes under agreement (ML)
2015/16	243,874
2014/15	472,971
2013/14	190,775
2009/10	194,428

Table 11: Discharges from supply channel escapes under agreement for 2015/16 (ML)

	Edward River Escape	Finley Escape	Wakool River Escape	Yallakool Creek Escape	Perricoota Escape	Wakool Town Escape	Niemur Syphon Escape	TOTAL
Jul 15	0	0	0	0	0	0	0	0
Aug 15	5,625	55	54	0	0	0	0	5,734
Sep 15	3,218	1,135	203	0	118	0	0	4,674
Oct 15	18,163	3,729	56	0	474	0	0	22,422
Nov 15	22,662	1,134	0	0	675	0	0	24,471
Dec 15	50,894	1,216	0	0	2,811	0	0	54,920
Jan 16	50,220	448	50	0	2,761	0	0	53,480
Feb 16	31,943	1,466	16	0	2,290	0	0	35,715
Mar 16	15,176	3,345	17	0	257	0	0	18,795
Apr 16	6,442	627	80	0	413	0	0	7,562
May 16	11,824	1,776	901	0	1,599	0	0	16,100
Jun 16	0	0	0	0	0	0	0	0
TOTAL 15/16	216,168	14,931	1,377	0	11,398	0	0	243,874

6.3.2 Discharges from supply channel escapes without credit

Discharges from supply channel escapes without credit is presented in Table 12.

Table 12: Discharge from supply channel escapes without credit for 2015/156(ML)

	Discharges from supply channel escapes without credit (ML)
Jul 15	0
Aug 15	0
Sep 15	336
Oct 15	307
Nov 15	84
Dec 15	51
Jan 16	88
Feb 16	59
Mar 16	128
Apr 16	83
May 16	291
Jun 16	98
TOTAL 15/16	1,525

A comparison of the discharges from the supply channel escapes without credit compared to previous years is presented in Table 13.

Table 13: Discharge from the supply channel escapes without credit compared to previous years (ML)

Year	Discharges from supply channel escapes without credit (ML)
2015/16	1,525
2014/15	7,090
2013/14	9,919
2009/10	1,203

6.3.3 Discharges from the stormwater escape channels

The volume of water discharged from stormwater escape channel discharge sites is presented in Table 15.

A comparison of the discharges from stormwater escape channels compared to previous years is presented in Table 14.

Table 14: Total discharges from the stormwater escape discharge sites compared to previous years (ML)

Year	Discharges from the stormwater escape discharge sites (ML)
2015/16	3,984
2014/15	4,895
2013/14	16,690
2009/10	1,522

Table 15: Discharges from the stormwater escape discharge sites for 2015/16 (ML)

	Back Barooga SEC: BBR1 (409092)	Berrigan Creek Escape: BIBE (41010396)	Box Creek: MOXM (409090)	Burraboai SEC: JIBU (40910125)	Burragorrimma SEC: NMBR (40910026)	DC 2500 East: JIJS (40910117)	Denibootea Canal Escape: DBCE (409067)
Jul 15	0	0	17	0	0	0	0
Aug 15	2	1	0	0	0	0	0
Sep 15	11	M	0	0	0	0	07
Oct 15	43	0	1	0	0	0	11
Nov 15	8	2	0	0	0	0	16
Dec 15	0	0	0	0	0	0	0
Jan 16	1	0	3	0	27	0	2
Feb 16	1	0	0	0	24	0	2
Mar 16	0	7	11	0	0	0	18
Apr 16	0	36	4	0	40	0	70
May 16	0	145	0	0	116	03	68
Jun 16	88	1,230	211	B	87	0	87
TOTAL 15/16	154	1,420	247	0	294	3	281
	Lalaly SEC: TUPJ (40910007)	Murphys Timber SEC: WRMT (40910131)	Neimur SEC: TCND (40910116)	North Deniliquin SEC: DENI (409060)	Pinelea SEC: TCPL (40910011)	Wakool SEC: DRWK (409073)	West Warragoona SEC: TCWW (40910130)
Jul 15	0	0	1	0	0	3	B
Aug 15	0	0	0	0	0	19	B
Sep 15	14	0	1	2	0	51	0
Oct 15	111	0	0	0	0	3	0
Nov 15	48	0	0	4	3	0	0
Dec 15	0	0	0	0	0	0	0
Jan 16	0	0	0	0	0	0	0
Feb 16	0	0	0	0	0	0	0
Mar 16	0	0	0	0	0	0	0
Apr 16	0	0	0	0	0	0	0
May 16	0	0	8	123	0	2	2
Jun 16	381	0	5	147	25	2	4
TOTAL 15/16	554	0	15	276	280	80	6
	Warragoona Stage : TCW2 (41000253)	Wollamai East Escape: BIWE (409089)	Wollamai Escape: BIOW (409076B)				
Jul 15	0	0	12				
Aug 15	0	0	7				
Sep 15	0	0	30				
Oct 15	0	5	15				
Nov 15	0	102	84				
Dec 15	0	0	0				
Jan 16	0	0	0				
Feb 16	0	0	2				
Mar 16	0	0	0				
Apr 16	0	0	8				
May 16	0	0	16				
Jun 16	0	0	93				
TOTAL 15/16	0	107	267				

M: equipment malfunction

0 (B): backed up: no flow, receiving waters flooded

Total stormwater escape discharges (2015/16): 3,984ML

6.4 Water Balance

A water balance for the Murray Irrigation Area of Operations is presented in Table 16.

Table 16: Water Balance for 2015/16 (ML)

	Mulwala Canal Offtake (ML)	Wakool Canal Offtake (ML)	Total (ML)
Extraction			
Gross Diversions	586,771	85,123	671,894
Deliveries			
On- farm Deliveries	277,345	61,553	338,898
Supply channel escapes under agreement	243,874	0	243,874
Total Deliveries	521,219	61,553	582,772
Losses			
Net Evaporation ¹	26,461	7,646	34,107
Seepage ²	31,616	7,296	38,912
Supply channel escapes without credit	1,373	152	1,525
Unattributed losses	6,102	8,476	14,578
Total Losses	65,552	23,570	89,122
Delivery Efficiency	89%	72%	87%

¹: Net evaporation is calculated from evapotranspiration minus rainfall

²: Indicative only

Note: Murray Irrigation does not have an off line storage

The unattributed losses include unintentional flows from operational margins, measurement error and errors not accounted for elsewhere.

6.5 Water use

Proposed water use data is recorded each time customers order water using the water ordering system. The customer is required to allocate the water order to a particular crop type for every order. The data presented in Table 17 is a summary of the data recorded for 2015/16. Meter readings are then recorded against the water order.

Murray Irrigation considers (with the exception of rice) the data presented for the total area of crop reported in Table 17 is indicative only and will be impacted by timing of rainfall and customers' irrigation practices. The crop water usage figures provided by the NSW DPI are based on seasons of 'normal' allocation. For instance, the crop water usage figure of 2 ML/ha for winter crops is based on two irrigations, one prior to sowing and a second irrigation in spring.

Table 17: Crop Water Usage for 2015/16 (ML)

	Mulwala Canal Offtake (ML)	Wakool Canal Offtake (ML)	Total (ML)	Total area (ha)
Annual Pasture	83,654	20,534	104,188	52,094 ¹
Cotton	4,080	3	4,083	454 ¹
Horticulture	11,153	212	11,365	
Permanent Pasture	21,867	3,722	25,588	1,968 ¹
Rice	32,896	5,423	38,319	3,418
Stock and domestic	4,965	1,241	6,206	
Storage	5,046	1,637	6,684	
Summer crops	31,449	6,166	37,616	4,702 ¹
Wetlands ²	4,167	5,066	9,232	
Winter crops	85,895	17,180	103,075	51,537 ¹
Unknown	2,829	370	3,199	
Total delivered (on-farm) (ML)	277,345	61,553	338,898	

¹: Calculated from crop usage figures obtained from the NSW DPI Farm Enterprise Budgets:

2ML/ha for annual pasture

13ML/ha for perennial pasture

2ML/ha for winter crops

9ML/ha for cotton

8ML/ha for summer crop (maize)

²: Environmental water delivered by arrangement with OEH.

A comparison of the crop water use compared to previous years is presented in Table 18.

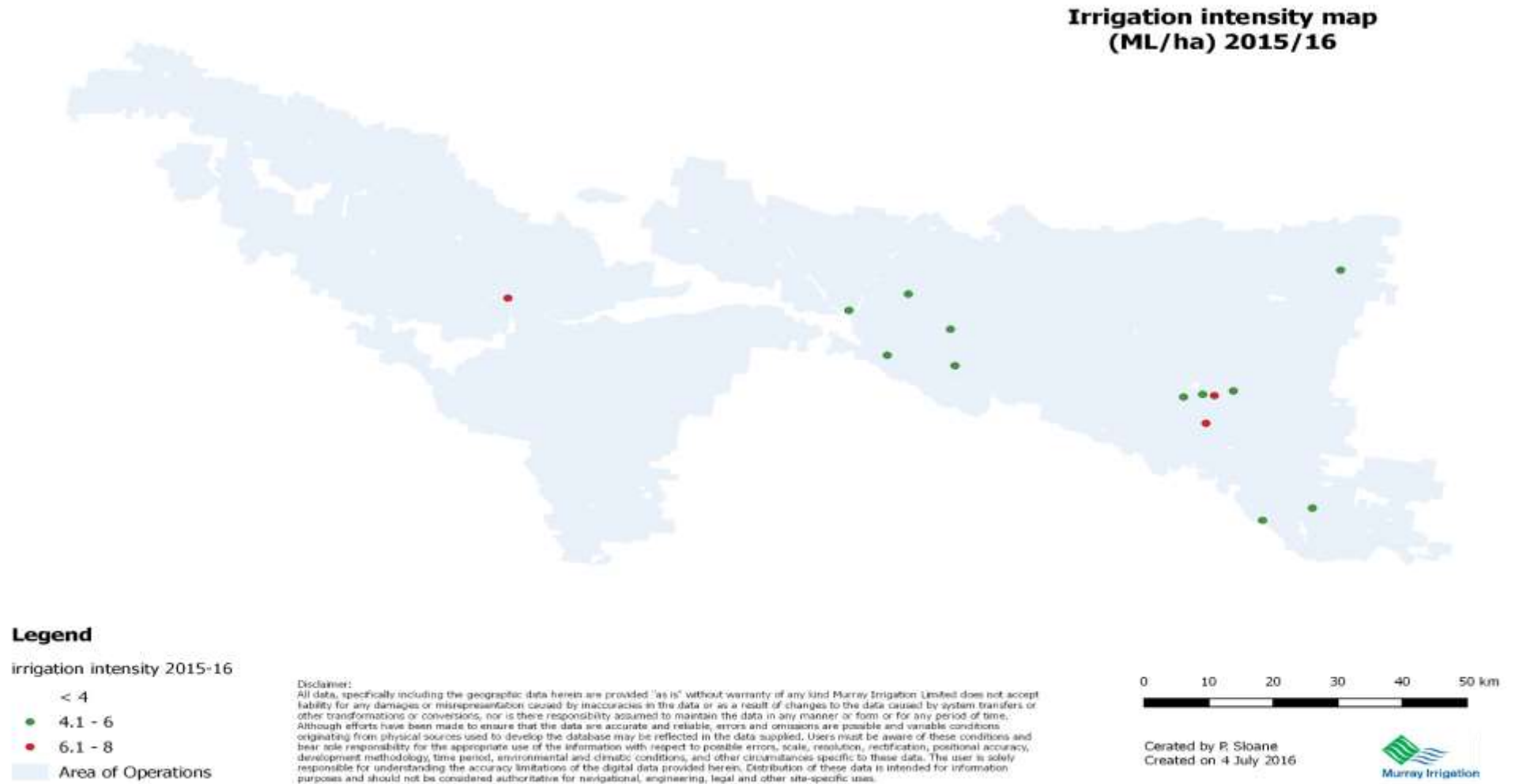
Table 18: Comparison of crop type water use compared to previous years (ML)

	2015/16	2014/15	2013/14		2009/10
Rice (ML)	38,319	333,170	484,936		41,831
Annual Pasture (ML)	104,188	149,688	142,214		56,729
Permanent Pasture (ML)	25,588	41,756	43,642		11,352
Cereals (ML)	103,075	123,085	130,229		25,836
Other (ML)	45,606	66,351	92,713		11,962
Stock & Domestic (ML)	6,206	8,989	5,727		8,675
Storage (ML)	6,684	6,075	19,564		3,688
Wetlands (ML)	9,232	9,896	5,545		1,402
Total delivered (on-farm) (ML)	338,898	739,010	924,570		161,473

6.6 Irrigation intensity

The distribution of irrigation intensity above 4ML/ha is reported in Figure 5. This map identifies the location of the landholdings using between 4 and 6ML/ha and landholdings using more than 6ML/ha.

Figure 5: Irrigation intensity (ML/ha)



7 REPORTING ON SALINITY AND SALTLOAD

7.1 Extracted salt load

The salt load for the Mulwala Canal Offtake is calculated using the salinity data from the monitoring site on the Murray River downstream of Yarrawonga Weir (409025).

The salt load for the Wakool Canal Offtake is calculated using the salinity data from the monitoring site on the Edwards River downstream of Stevens Weir (409023).

Both sets of salinity data were downloaded from the DPI-Water Real Time Data site (<http://realtimedat.water.nsw.gov.au/water.stm>).

The extracted salt load is presented in Table 19.

Table 19: Extracted salt load for 2015/16 (t)

	Mulwala Canal Offtake (t)	Wakool Canal Offtake (t)	Total saltload extracted (t)
Jul 15	31	75	106
Aug 15	1,688	704	2,392
Sep 15	1,168	379	1,547
Oct 15	3,992	1,358	5,351
Nov 15	5,120	848	5,968
Dec 15	7,379	1,114	8,493
Jan 16	6,861	1,055	7,917
Feb 16	4,971	740	5,711
Mar 16	5,508	953	6,461
Apr 16	2,485	719	3,204
May 16	871	149	1,020
Jun 16	0	0	0
TOTAL 15/16	40,074	8,094	48,169

A comparison of the total saltload extracted compared to previous years is presented in Table 20.

Table 20: Extracted salt load compared to previous years (t)

Year	Extracted salt load(t)
2015/16	48,169
2014/15	50,121
2013/14	51,221
2009/10	13,078

7.2 Discharged salt load

7.2.1 Discharged salt load from supply channel escapes under agreement

The discharged salt load from the supply channel escapes under agreement is presented in Table 22.

A comparison of the salt load discharged from the supply channel escapes under agreement compared to previous years is presented in Table 21.

Table 21: Discharged salt load from the supply channel escapes under agreement compared to previous years (t)

Year	Discharged salt load from supply channel escapes under agreement (t)
2015/16	7,553
2014/15	12,365
2013/14	7,602
2009/10	5,833

Table 22: Discharged salt load from the supply channel escapes under agreement (t)

	Edward River Escape (t)	Finley Escape (t)	Wakool River Escape (t)	Yallakool Creek Escape (t)	Perricoota Escape (t)	Wakool Town Escape (t)	Niemur Syphon Escape (t)	TOTAL (t)
Jul 15	0	0	0	0	0	0	0	0
Aug 15	101	1	2	0	0	0	0	104
Sep 15	67	23	8	0	4	0	0	102
Oct 15	401	82	2	0	18	0	0	504
Nov 15	754	38	0	0	27	0	0	818
Dec 15	1,709	41	0	0	99	0	0	1,849
Jan 16	1,686	15	2	0	93	0	0	1,795
Feb 16	970	45	1	0	77	0	0	1,093
Mar 16	451	99	1	0	10	0	0	561
Apr 16	177	17	4	0	19	0	0	217
May 16	333	50	33	0	59	0	0	476
Jun 16	0	0	0	0	0	0	0	0
TOTAL 15/16	6,649	412	53	0	439	0	0	7,553

7.2.2 Discharged salt load from supply channel escapes without credit

The discharged salt load from the supply channel escapes without credit is presented in Table 23.

Table 23: Discharged salt load from supply channel escapes without credit for 2015/16 (t)

	Discharged salt load from supply channel escapes without credit (t)
Jul 15	0
Aug 15	0
Sep 15	7
Oct 15	7
Nov 15	3
Dec 15	2
Jan 16	3
Feb 16	2
Mar 16	4
Apr 16	2
May 16	8
Jun 16	3
TOTAL 15/16	40

A comparison of the discharged salt load from the supply channel escapes without credit is presented in Table 24.

Table 24: Discharged salt load from the supply channel escapes without credit compared to previous years (t)

Year	Discharged salt load from supply channel escapes without credit (t)
2015/16	40
2014/15	180
2013/14	393
2009/10	36

7.2.3 Discharged salinity and salt load from the stormwater escape channels

The salinity and discharged salt load from the stormwater escape channel is presented in Table 26.

A comparison of the salt load discharged from the stormwater escape channels compared to previous years is presented in Table 25.

Table 25: Total salt load from the stormwater escape discharge sites compared to previous years (t)

Year	Discharges salt load from the stormwater escape discharge sites (t)
2015/16	729
2014/15	1,651
2013/14	4,492
2009/10	114

Table 26: Stormwater Escape Channels salinity ($\mu\text{S/cm}$) and salt load (t)

	Back Barooga SEC: BBR1 (409092)				Berrigan Creek Escape: BIBE (41010396)			
	Min. daily EC ($\mu\text{S/cm}$)	Max. daily EC ($\mu\text{S/cm}$)	Mean daily EC ($\mu\text{S/cm}$)	Salt load (t)	Min. daily EC ($\mu\text{S/cm}$)	Max. daily EC ($\mu\text{S/cm}$)	Mean daily EC ($\mu\text{S/cm}$)	Salt load (t)
Jul 15	234	347	289	0	N/A	N/A	N/A	0
Aug 15	267	412	336	0	88	139	119	0
Sep 15	297	640	431	2	52	152	103	M
Oct 15	226	601	458	11	74	112	91	0
Nov 15	327	649	421	0	101	249	195	0
Dec 15	N/A	N/A	N/A	0	103	103	103	0
Jan 16	198	224	213	0	90	105	95	0
Feb 16	201	512	373	0	174	174	174	0
Mar 16	443	443	443	0	61	187	116	1
Apr 16	N/A	N/A	N/A	0	81	214	158	3
May 16	229	512	406	0	76	249	150	10
Jun 16	139	289	218	9	77	206	147	106
TOTAL 15/16				22				120
	Box Creek: MOXM (409090)				Burraboi SEC: JIBU (40910125)			
	Min. daily EC ($\mu\text{S/cm}$)	Max. daily EC ($\mu\text{S/cm}$)	Mean daily EC ($\mu\text{S/cm}$)	Salt load (t)	Min. daily EC ($\mu\text{S/cm}$)	Max. daily EC ($\mu\text{S/cm}$)	Mean daily EC ($\mu\text{S/cm}$)	Salt load (t)
Jul 15	1,430	2,360	1,900	18	N/A	N/A	N/A	0
Aug 15	154	2,190	1,430	0	N/A	N/A	N/A	0
Sep 15	3,820	4,710	4,430	1	N/A	N/A	N/A	0
Oct 15	130	155	143	0	N/A	N/A	N/A	0
Nov 15	131	131	131	0	N/A	N/A	N/A	0
Dec 15	N/A	N/A	N/A	0	N/A	N/A	N/A	0
Jan 16	62	66	64	0	N/A	N/A	N/A	0
Feb 16	81	81	81	0	N/A	N/A	N/A	0
Mar 16	78	113	93	1	N/A	N/A	N/A	0
Apr 16	61	127	87	0	N/A	N/A	N/A	0
May 16	76	115	88	0	0	65	66	0
Jun 16	169	1,770	651	114	138	194	197	B
TOTAL 15/16				134				0
	Burragorrimma SEC: NMBR (409010026)				DC 2500 East: JIJS (40910117)			
	Min. daily EC ($\mu\text{S/cm}$)	Max. daily EC ($\mu\text{S/cm}$)	Mean daily EC ($\mu\text{S/cm}$)	Salt load (t)	Min. daily EC ($\mu\text{S/cm}$)	Max. daily EC ($\mu\text{S/cm}$)	Mean daily EC ($\mu\text{S/cm}$)	Salt load (t)
Jul 15	N/A	N/A	N/A	0	617	645	77629	0
Aug 15	N/A	N/A	N/A	0	748	815	7892	0
Sep 15	N/A	N/A	N/A	0	697	991	827	0
Oct 15	N/A	N/A	N/A	0	N/A	N/A	N/A	0
Nov 15	N/A	N/A	N/A	0	N/A	N/A	N/A	0
Dec 15	N/A	N/A	N/A	0	N/A	N/A	N/A	0
Jan 16	200	301	254	4	N/A	N/A	N/A	0
Feb 16	275	442	359	5	N/A	N/A	N/A	0
Mar 16	N/A	N/A	N/A	0	N/A	N/A	N/A	0
Apr 16	201	313	256	6	N/A	N/A	N/A	0
May 16	72	238	139	9	338	775	533	0
Jun 16	87	158	133	7	561	561	561	1
TOTAL 15/16				31				1

	Denibootea Canal Escape: DBCE (409067)				Lalaly SEC: TUPJ (40910007)			
	Min. daily EC (µS/cm)	Max. daily EC (µS/cm)	Mean daily EC (µS/cm)	Salt load (t)	Min. daily EC (µS/cm)	Max. daily EC (µS/cm)	Mean daily EC (µS/cm)	Salt load (t)
Jul 15	290	427	349	0	N/A	N/A	N/A	0
Aug 15	239	310	260	0	N/A	N/A	N/A	0
Sep 15	93	372	250	0	143	190	159	1
Oct 15	91	361	176	1	138	192	163	10
Nov 15	95	834	413	2	1,030	2,320	1,730	36
Dec 15	N/A	N/A	N/A	0	N/A	N/A	N/A	0
Jan 16	225	450	323	0	N/A	N/A	N/A	0
Feb 16	162	383	260	0	N/A	N/A	N/A	0
Mar 16	82	279	155	1	N/A	N/A	N/A	0
Apr 16	69	161	101	4	N/A	N/A	N/A	0
May 16	68	371	163	4	N/A	N/A	N/A	0
Jun 16	100	226	152	8	428	1,850	954	243
TOTAL 15/16				20				291
	Murphys Timber SEC: WRMT (40910131)				Neimur SEC: TCND (40910116)			
	Min. daily EC (µS/cm)	Max. daily EC (µS/cm)	Mean daily EC (µS/cm)	Salt load (t)	Min. daily EC (µS/cm)	Max. daily EC (µS/cm)	Mean daily EC (µS/cm)	Salt load (t)
Jul 15	378	410	393	0	265	276	271	0
Aug 15	372	378	375	0	N/A	N/A	N/A	0
Sep 15	369	375	371	0	168	849	319	0
Oct 15	374	633	477	0	164	164	164	0
Nov 15	639	843	746	0	N/A	N/A	N/A	0
Dec 15	801	935	852	0	N/A	N/A	N/A	0
Jan 16	935	1,240	1,120	0	N/A	N/A	N/A	
Feb 16	1,220	1,510	1,360	0	N/A	N/A	N/A	0
Mar 16	1,250	1,700	1,630	0	N/A	N/A	N/A	0
Apr 16	1,700	1,840	1,760	0	N/A	N/A	N/A	0
May 16	503	1,710	948	0	246	756	467	2
Jun 16	472	498	478	0	182	904	343	1
TOTAL 15/16				0				3
	North Deniliquin SEC: DENI (409060)				Pinelea SEC: TCPL (40910011)			
	Min. daily EC (µS/cm)	Max. daily EC (µS/cm)	Mean daily EC (µS/cm)	Salt load (t)	Min. daily EC (µS/cm)	Max. daily EC (µS/cm)	Mean daily EC (µS/cm)	Salt load (t)
Jul 15	115	129	122	0	N/A	N/A	N/A	0
Aug 15	N/A	N/A	N/A	0	305	358	331	0
Sep 15	129	207	154	0	303	373	340	0
Oct 15	178	210	193	0	N/A	N/A	N/A	0
Nov 15	177	231	196	1	214	449	338	1
Dec 15	N/A	N/A	N/A	0	N/A	N/A	N/A	0
Jan 16	N/A	N/A	N/A	0	N/A	N/A	N/A	0
Feb 16	N/A	N/A	N/A	0	N/A	N/A	N/A	0
Mar 16	N/A	N/A	N/A	0	N/A	N/A	N/A	0
Apr 16	N/A	N/A	N/A	0	N/A	N/A	N/A	0
May 16	115	343	224	13	N/A	N/A	N/A	0
Jun 16	92	485	279	21	205	440	296	5
TOTAL 15/16				35				6

	Wakool SEC: DRWK (409073)				West Warragoon SEC: TCWW (40910130)			
	Min. daily EC (µS/cm)	Max. daily EC (µS/cm)	Mean daily EC (µS/cm)	Salt load (t)	Min. daily EC (µS/cm)	Max. daily EC (µS/cm)	Mean daily EC (µS/cm)	Salt load (t)
Jul 15	180	237	214	0	690	734	712	B
Aug 15	153	301	224	2	664	697	682	B
Sep 15	147	287	201	5	666	714	693	0
Oct 15	259	505	342	0	695	737	723	0
Nov 15	N/A	N/A	N/A	0	376	779	710	0
Dec 15	N/A	N/A	N/A	0	758	812	785	0
Jan 16	N/A	N/A	N/A	0	643	853	776	0
Feb 16	N/A	N/A	N/A	0	586	693	638	0
Mar 16	N/A	N/A	N/A	0	430	926	551	0
Apr 16	N/A	N/A	N/A	0	593	961	711	B
May 16	198	434	322	0	105	1,230	601	0
Jun 16	270	322	308		258	767	501	1
TOTAL 15/16				7				1
	Warragoon Stage 2: TCW2 (41000253)				Wollamai East Escape: BIWE (409089)			
	Min. daily EC (µS/cm)	Max. daily EC (µS/cm)	Mean daily EC (µS/cm)	Salt load (t)	Min. daily EC (µS/cm)	Max. daily EC (µS/cm)	Mean daily EC (µS/cm)	Salt load (t)
Jul 15	N/A	N/A	N/A	0	N/A	N/A	N/A	0
Aug 15	N/A	N/A	N/A	0	N/A	N/A	N/A	0
Sep 15	N/A	N/A	N/A	0	N/A	N/A	N/A	0
Oct 15	N/A	N/A	N/A	0	148	217	187	1
Nov 15	N/A	N/A	N/A	0	86	429	286	15
Dec 15	N/A	N/A	N/A	0	N/A	N/A	N/A	0
Jan 16	N/A	N/A	N/A	0	N/A	N/A	N/A	0
Feb 16	M	M	M	MO	N/A	N/A	N/A	0
Mar 16	N/A	N/A	N/A	0	N/A	N/A	N/A	0
Apr 16	N/A	N/A	N/A	0	N/A	N/A	N/A	0
May 16	N/A	N/A	N/A	0	N/A	N/A	N/A	0
Jun 16	M	M	M	M	226	266	254	0
TOTAL 15/16				0				16
	Wollamai Escape: BLOW (409076B)							
	Min. daily EC (µS/cm)	Max. daily EC (µS/cm)	Mean daily EC (µS/cm)	Salt load (t)				
Jul 15	154	303	224	2				
Aug 15	264	324	308	1				
Sep 15	232	1,110	374	7				
Oct 15	0	649	264	3				
Nov 15	110	360	260	13				
Dec 15	N/A	N/A	N/A	0				
Jan 16	N/A	N/A	N/A	0				
Feb 16	0	437	111	0				
Mar 16	N/A	N/A	N/A	0				
Apr 16	181	301	237	1				
May 16	105	285	155	1				
Jun 16	110	501	269	15				
TOTAL 15/16				43				

D: debris affecting sensor
Note: Sites with ponded water show salinity measurement with zero saltload calculated due to no flow
N/A: dry or probe out of water
M: equipment malfunction
0 (B): backed up, no flow, receiving waters flooded

Total stormwater escape salt load 2015/16: 729t

7.3 Salt balance

A salt balance for the Murray Irrigation Area of Operations is presented in Table 27.

Table 27: Salt Balance for 2015/16 (t)

	Salt load (t)
Total extraction	50,121
Discharges	
Supply channel escapes under agreement	7,553
Supply channel escapes without credit	40
Stormwater Escapes	729
Total discharged	8,322
Balance (2015/16)	41,799t (imported)

8 REPORTING ON GROUNDWATER CONDITIONS

A total of 1,449 piezometers are listed in Schedule 5-A of the Combined Approval. In August 2014, the results from 1,355 (94%) piezometers were used in the data analysis of the depth to watertable. The data for August 2014 was audited according to the procedures outlined in the Murray Irrigation Piezometer Manual 2009.

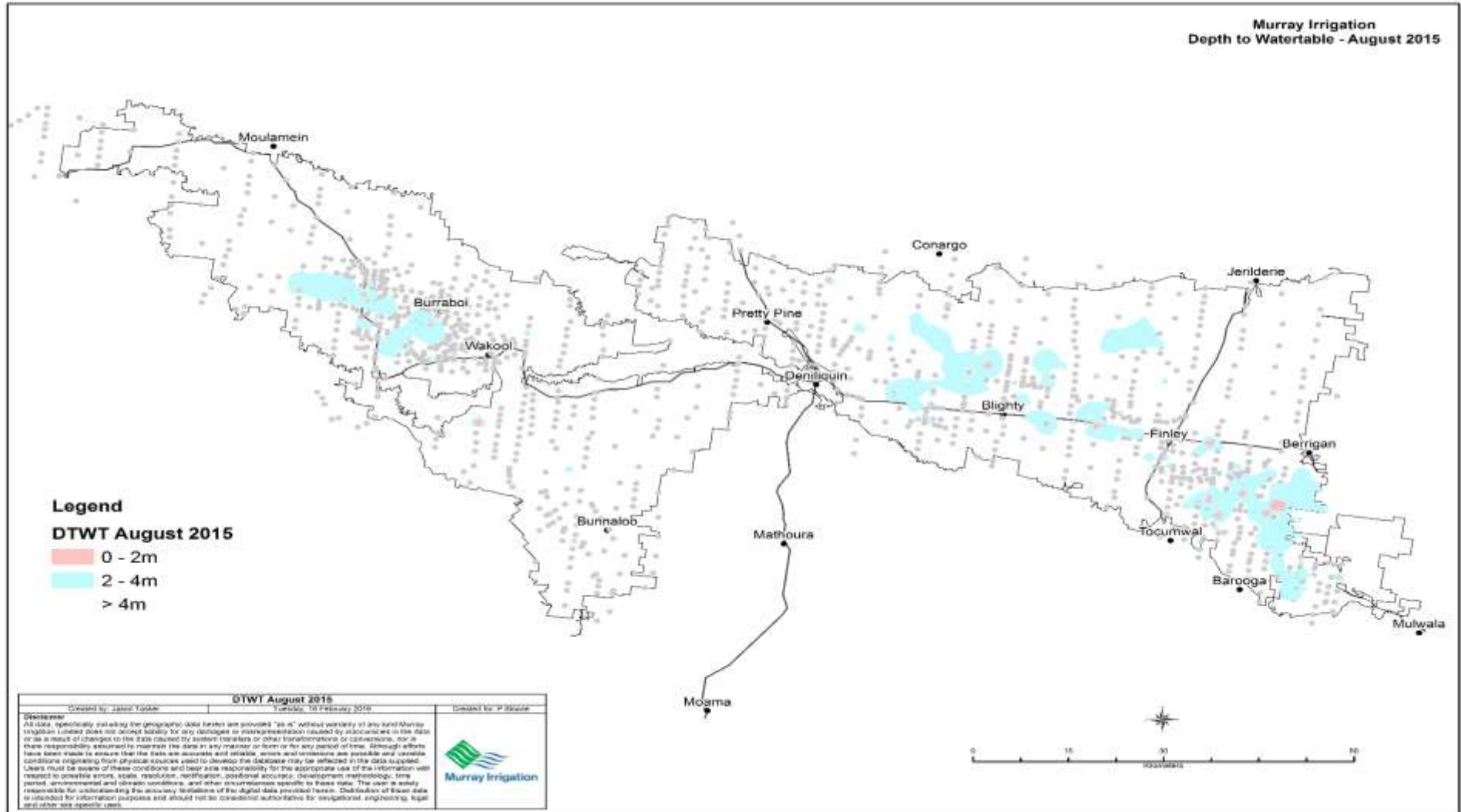
The depth to watertable data for August 2015 is presented in Table 28. The map of the depth to watertable for August 2015 is presented in Figure 6.

Table 28: Depth to watertable area (ha)

	0-2 m (ha)	2-4 m (ha)	>4 m (ha)	Total Boundary (ha)
Aug 15	2,442	60,405	730,481	793,328
Aug 14	7,194	78,501	707,633	793,328
Aug 13	5,642	62,305	725,381	793,328
Aug 09	11	4,606	788,711	793,328

The Area of Operations affected by watertable within 2m remains extremely low. Murray Irrigation considers the rise in the watertable in the 2-4m range is attributed to the combination of the rainfall events and increased irrigation usage on-farm.

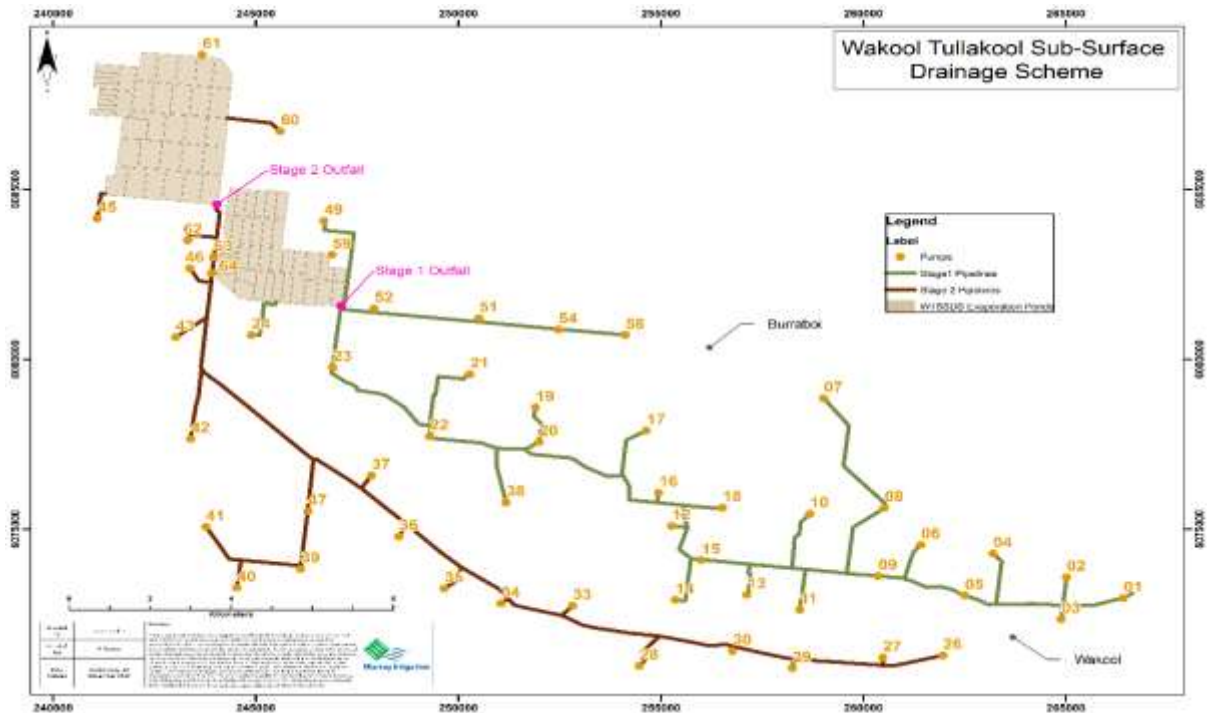
Figure 6: Depth to watertable (August 2015)



9 REPORTING ON SALINITY AND WATERTABLE MANAGEMENT TUBEWELLS

This section covers the reporting requirements for the Combined Water Supply Work Approval and Water Use Approval for salinity and watertable management tube wells, Approval number 50CA512282.

Figure 7: Wakool Tullakool Subsurface Drainage Scheme map



In August 2014, 833ha of the 75,499ha area influenced directly by the Wakool Tullakool Sub-Surface Drainage Scheme (WTSSDS) had watertables within 2m of the surface. A summary of the area affected by watertable within 2m of the surface in the WTSSDS area of influence compared to previous years is presented in Table 29.

Table 29: Area of WTSSDS with watertable within 2m of the surface (ha)

	Area of WTSSDS with watertable < 2 m (ha)
2015/16 (Aug 15)	259
2014/15 (Aug 14)	833
2013/14 (Aug 13)	885
2009/10 (Aug 09)	11

During 2015/16 pumping rates from the WTSSDS bores were reduced to minimal levels due to the low watertables in the area. The total volume pumped from the WTSSDS scheme is presented in Table 30.

Table 30: Volume pumped monthly into WTSSDS basins for 2015/16 (ML)

	Stage 1	Stage 2
Jul 15	0	0
Aug 15	0	0
Sep 15	0	0
Oct 15	0	0
Nov 15	0	0
Dec 15	0	0
Jan 16	0	0
Feb 16	0	0
Mar 16	1	1
Apr 16	1	1
May 16	0	1
Jun 16	0	
TOTAL 15/16	2	4

Total volume pumped WTSSDS 2015/16: 6ML

The salinity at each of the pump sites within the WTSSDS is presented in Table 31.

Table 31: Salinity at WTSSDS pump sites

Pump site Number	Salinity Sep 2015 (uS/cm)	Salinity Feb 2016 (uS/cm)
1	4,320	4,650
2	2,670	2,790
3	11,100	13,720
4	20,300	20,100
5	30,600	30,200
6	38,100	39,500
7	38,500	38,400
8	29,700	30,700
9	4,380	4,840
10	34,800	34,700
11	11,830	12,480
12	987	1,294
13	5,560	5,960
14	15,530	17,580
15	33,400	26,900
16	16,920	126,100
17	12,580	12,530
18	38,600	38,400
19	6,360	68,020
20	6,780	6,870

Pump site Number	Salinity Sep 2015 (uS/cm)	Salinity Feb 2016 (uS/cm)
21	28,700	26,100
22	33,600	34,100
23	14,920	15,240
24	47,300	46,700
26	15,710	15,320
27	9,180	9,430
28	25,100	24,500
29	6,050	6,670
30	2,160	2,150
33	5,950	6,120
34	5,200	4,710
35	2,750	2,910
36	4,630	5,210
37	41,700	41,200
38		30,100
39	7,570	8,200
40	25,600	25,700
41	9,330	26,900
42	61,000	60,800
43	36,400	36,900
45	59,500	60,800
46	126,800	58,400
47	2,730	3,330
49	5,980	27,410
51	15,400	313
52	4,220	312
54	10,460	36,900
58	40,500	40,700
59	12,540	12,430
60	2,460	3,340
61	2,440	4,680
62	108,800	75,700
63	207,000	20,600
64	65,600	96,700
Stage 1 outfall		16,500
Stage 2 outfall		145,000

A simple salt balance for the WTSSDS is presented in Table 32. There was no salt harvested from the WTSSDS basins in 2014/15. The tonnes of salt pumped is calculated using the average salinity for Stage 1 outfall and the total volume pumped into the basins in 2015/16.

Table 32: Simple salt balance for the WTSSDS

	Salt load (t)
Total Extraction (pumped)	300t
Total Discharged (harvested)	0
Balance (2015/16)	394(imported)

10 DATA REPORT

10.1 Stormwater discharge sites

A summary of the data omissions for 2015/16 is presented in Table 33.

Table 33: Data omissions for the stormwater discharge sites

Site name	Type of data loss	Dates	Comment
Berrigan Creek Escape: BIBE (41010396)	Discharge	1 Sep – 6 Oct	Equipment malfunction
Lalaly Drain: TUPJ (40910007)	Discharge Salinity	6 Oct – 9 Oct	Equipment malfunction
DC2500 East: JIJS (40910117)	Discharge Salinity	2 Jun – 30 Jun	Equipment malfunction
Warragoon Stage 2: TCW2 (41000253)	Discharge Salinity	1 Jul -16 Jul 3 Feb – 28 Feb 2 Jun – 30 Jun	Equipment malfunction

Routine practice is that sites are visited by Murray Irrigation staff weekly and water samples are collected as required. The field data is used to complement recorded data, particularly at times when sensors malfunction.

10.2 Piezometers

A summary of the piezometers that are no longer operational are listed in Table 34.

Table 34: Piezometers no longer functional August 2015

Site ID	Comment	Site ID	Comment
BQ1018	Destroyed	WAK1485	Destroyed
BQ1158	Destroyed	WAK1524	Destroyed
BQ1167	Destroyed	WAK1571	Destroyed
BQ1366	Destroyed	WAK1689	Destroyed
BQ1449	Destroyed	WAK1693	Destroyed
BQ299	Destroyed	WAK1716	Destroyed
BQ302	Destroyed	WAK199	Destroyed
BQ3186	Destroyed	WAK2655	Destroyed
BQ3338	Destroyed	WAK2777	Destroyed
BQ337S	Destroyed	WAK2778	Destroyed
BQ3383	Destroyed	WAK3214	Destroyed
BQ3394	Destroyed	WAK430	Destroyed
BQ348S	Destroyed	WAK509	Destroyed
BQ468	Destroyed	WAK511	Destroyed
BQ535	Destroyed	WAK515	Destroyed
BQ536A	Destroyed	WAK532	Destroyed
BQ537A	Destroyed	WAK592	Destroyed
BQ638	Destroyed	WAK598	Destroyed
BQ649	Destroyed	WAK609	Destroyed
BQ661	Destroyed	WAK625	Destroyed
BQ760	Destroyed	WAK712	Destroyed
DB12	Destroyed	WAK723	Destroyed
DB2	Destroyed	WAK923	Destroyed
DB20	Destroyed	WAK986	Destroyed
DB28	Destroyed		
DN2062	Destroyed		
DN2098	Destroyed		
DN63	Destroyed		
DN64	Destroyed		
WAK1240	Destroyed		
WAK1281	Destroyed		
WAK1445	Destroyed		
WAK1478	Destroyed		

10.3 Calibration report for the Mulwala Canal and Wakool Canal AFFRA units.

The calibration report for the Mulwala Canal and Wakool Canal AFFRA units has been provided by the Thiess Hydrographic Services as part of the contract with Murray Irrigation to provide qualified hydrographic services. Refer to Table 35 for the Mulwala Canal AFFRA calibration report and Table 36 for the Wakool Canal AFFRA calibration report.

Table 35: Mulwala Main Channel @ Offtake (409026) calibration report

Date	Time	Calibration Measurements: Q, Measured Discharge (ML/day)	AFFRA Sensor: Q (ML/day)	Deviation
3 Aug 2015	09:34	972	984	-0.97%
1 Sep 2015	14:51	692	690	0.25%
1 Oct 2015	09:29	3795	3820	-0.66%
1 Mar 2016	11:09	2130	2149	0.89%

Table 36: Wakool Main Channel @ Offtake (409022) calibration report

Date	Time	Calibration Measurements: Q, Measured Discharge (ML/day)	AFFRA Sensor: Q (ML/day)	Deviation
24 Aug 2015	11:26	228	240	-4.82%
7 Oct 2015	08:15	595	613	-2.93%
8 Oct 2015	07:27	633	627	0.98%
10 Dec 2015	11:10	135	221	-39.01%*
10 Feb 2016	09:26	237	234	1.11%

*: only path 1 on the AFFRA working at the time. This measurement is very low and has been disregarded for calibration purposes

11 ENVIRONMENT PROTECTION LICENCE REPORTING

This report is based on the Environment Protection Licence number 5014 dated 31 March 2011 issued by the Environment Protection Authority (EPA)

There were no reports of non-compliance by Murray Irrigation with the EPA licence during 2015/16. Murray Irrigation considers all clauses of the EPA licence were complied with during 2015/16.

11.1 Nutrient Monitoring

Nutrient monitoring is triggered when flows in the stormwater escape channels exceed 5ML/day. The results are reported in Table 37.

Table 37: Nutrient monitoring for 2015/16

Date	Turbidity (NTU)	Total Phosphorus (mg/L)	Total Nitrogen (mg/L)
Berrigan Creek Escape: BIBE (41010396)			
07-Jun-16	119	0.359	1.4
Back Barooga Drain: BBR1 (409092)			
07-Jun-16	227	0.144	3.2
Box Creek: MOXM (409090)			
07-Jun-16	284	0.198	1.2
Wollamai East Escape: BIWE (409076)			
07-Jun-16	225	0.287	1.1
Lalaly SEC: TUPJ (40910007)			
10-Nov-15	22	0.141	0.9
17-Jun-16	82	0.171	1.2
North Deniliquin SEC: DENI (409060)			
31-May-16	325	0.266	1.7
07-Jun-16	234	0.405	1.8
Wollamai East Escape: BIWE (409089)			
07-Nov-15	261	0.193	0.9

11.2 Pesticide Monitoring

In September 2015 Murray Irrigation was granted a temporary variation to the pesticide monitoring requirements of the Environment Protection Licence for the 2015-16 irrigation season. The temporary variation removed the requirement to test samples for molinate using ELISA kits for the 2015-16 season and temporarily suspended the requirement for pesticides at testing at sites DRWK, DBCE, BBR1 and WRMT.

Table 38: Pesticide monitoring results 2015-16

Site	Date sample	Laboratory Results			
		Atrazine (µg/L)	Thiobencarb (µg/L)	Molinate (µg/L)	Date results received
BIOW (409076) Wollamai Escape	10 Nov 16	<2	<1	<1	13 Nov 16
BIWE (4090989) Wollamai East Escape	10 Nov 16	<2	<1	<1	13 Nov 16
TUPJ (40910007) Lalaly Drain	10 Nov 16	<2	<1	<1	13 Nov 16

11.3 Chemical Usage Report

An indication of the chemicals used by landholders in the Murray Irrigation Area of Operations has been sourced from the following NSW DPI Management Guidelines:

- Weed Control in Lucerne and Pastures
- Weed Control in Winter Crops
- Weed Control in Rice

The list of chemicals has been based on the premise that landholders will use the cheapest option in weed control. Landholders' decisions on the choice of chemicals used are also based on the decrease in the price of the product when patents on the active ingredient expire. Refer to Table 39.

Table 39: Chemicals used by landholders

glyphosate	triclopyr	MCPA	chlorsulfuron
atrazine	trifluralin	bromoxynil	oxyfluorfen
metsulfuron- methyl	2,4-D ester	dicamba	triasulfuron
simazine	2,4-D amine	s-metachlor	molinate
thiobencarb	benzofenap	clomazone	cyhalofop
bensulfuron methyl	chlorpyrifos	maldison	

12 OTHER MONITORING – TUPPAL CREEK

Murray Irrigation delivered water for environmental purposes on behalf of the NSW Office of Environment and Heritage (OEH).

A site has been established on the Tuppall Creek downstream of the Tocumwal supply channel escape to enable Murray Irrigation to closely monitor the salinity in the Tuppall Creek (TULAL). The site is located downstream of the discharge point of the environmental water from the supply system. This location enables Murray Irrigation to ensure any discharges from the Lalaly SEC located do not adversely impact on the salinity in the Tuppall Creek.

A second site is located in the Tuppall Creek upstream of the outfall of the Pinelea SEC to monitor the salinity in the Tuppall Creek.

The data for the salinity monitoring in the Tuppall Creek is presented in Table 40.

Table 40: Tuppall Creek salinity monitoring (2015/16)

Site	Min daily EC ($\mu\text{S/cm}$)	Max. daily EC ($\mu\text{S/cm}$)	Mean daily EC ($\mu\text{S/cm}$)
Tuppall Creek D/S Toc Esc: TULAL (40910129)	30	2,201	134
Tuppall Creek U/S Pinelea SEC: TUP1 (40910025)	30	1,820	162