

7. Burnett Basin Water Resource Plan

7.1 2007–08 highlights

Highlights in the Burnett Basin Water Resource Plan (WRP) area during the reporting period included the following:

- Tradable supplemented water allocations in the Burnett Basin WRP area increased to 4330.
- An extra 85 tradable water allocations were created through subdivision of existing water allocations.
- On average, 78 per cent of the available water across all water supply schemes was taken by water users.
- The Barker–Barambah, Upper Burnett, Bundaberg and Boyne–Tarong water supply schemes were under critical water supply arrangements until February 2008.
- Water trading occurred, with 121 permanent transfers separate from land, a further 171 trades with land and 250 seasonal water assignments of supplemented water allocations.
- In November 2007, the Minister announced the finalisation of amendments to the Burnett Basin WRP to include the Coastal Burnett Groundwater Management Area.
- A fish ladder constructed by SunWater Ltd on Claude Wharton Weir at Gayndah was commissioned in May 2008.

7.2 Overview

The Burnett Basin WRP was approved in December 2000. It applies to water in a watercourse, lake or spring in the Burnett Basin and includes the Burnett, Boyne, Kolan, Auburn, Barambah, Stuart, Elliott, Gregory and Isis rivers.

The Burnett Basin WRP is implemented through the Burnett Basin Resource Operations Plan (ROP), which was initially approved in May 2003. The WRP, ROP and a map of the catchment can be viewed by visiting the NRW website <www.nrw.qld.gov.au/wrp/burnett.html>.

The effectiveness of the WRP and the ROP in achieving the outcomes for the sustainable management of water is discussed in section 7.6.

7.2.1 Changes to the plan

In November 2007, the Burnett Basin WRP was amended to include the Coastal Burnett Groundwater Management Area (CBGMA). This amendment was initiated because of concerns over water availability caused by declining aquifer levels, ecosystem needs

and continuing risks to the groundwater resource from seawater intrusion.

The amendment:

- defines the availability of groundwater in the CBGMA
- provides a consistent, whole-of-aquifer management approach that will integrate with the existing WRP
- provides for the establishment of tradable water allocations
- provides for the protection of natural ecosystems.

Key outcomes of the amendment include:

- continued access by current authorised groundwater users
- maintenance of, or improvement in, groundwater levels to support native plants and animals
- reduction in seawater intrusion and protection of aquifers from further intrusion.

The WRP will be implemented by amending the existing Burnett Basin ROP. The ROP will:

- detail the process for converting groundwater authorisations including licences
- define water sharing rules
- establish groundwater monitoring and reporting requirements
- outline rules for water trading.



Gavin Eddie conducting bore sampling at the corner of Hummock and Heidkes Road, Bundaberg (Photo: Matthew Tuffield)

The department is currently consulting water users and preparing the ROP. The draft ROP will be released for public comment via a formal submission process. It is expected that the draft ROP will be released in mid-2009 and finalised by early 2010.

Together, the WRP and ROP introduce new arrangements for access to groundwater within the CBGMA.

On 16 February 2008, the chief executive announced his decision not to proceed with the amendment of the ROP to include the Three Moon Creek Project Area. This decision was made to ensure that greater flexibility for the operation of the scheme, in accordance with the existing operating arrangements, can be catered for through the review

process scheduled for the Burnett Basin WRP. The most efficient approach for provision of that greater flexibility to meet the needs of the water user community, and to address the outcomes of the WRP, would be to include the Three Moon Creek Project Area in the Burnett Basin ROP after the review of the WRP. The review of the WRP will commence in 2008–09.

7.2.2 Streamflow

Streamflow discharges for the reporting period were generally well below the long-term average (Figure 7.1). Individual monthly discharge totals in unsupplemented streams were mostly less than 3 per cent of their mean values, and most streams

Figure 7.1 Monthly stream discharge volumes (ML) for 2007–08

Site No.	Period	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Total
135002A ¹	2007-08	0.0	0.0	0.0	0.0	0.0	0.0	2792.9	34512.6	720.7	137.4	22.5	924.2	39110.3
136007A	2007-08	359.4	352.6	205.4	130.5	117.8	3120.0	3887.5	5538.4	484.4	567.1	508.0	562.9	15833.9
	Mean ²	53510.6	16592.1	13061.0	25521.1	36291.8	85231.1	230570.1	367837.4	197859.8	62596.0	66860.1	68731.2	1233055.8
	Median ²	5709	2897	3362	5201	7115	27680	57815	57077	36971	13758	5414	4950.5	599450
136094A	2007-08	57.6	10.3	19.3	4.7	0.1	0.0	0.0	7049.3	417.8	301.4	285.5	152.7	8298.7
	Mean ²	27834.1	8024.8	6938.7	12476.4	18320	40255.8	102268.2	205766.1	90415.5	29326.1	37110.3	38162.8	620935.5
	Median ²	2361	789	392	2596	3818	9545	22397.5	16912	15820.5	3774	2314	2222	335404
136103B	2007-08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13598.1	4.2	6.9	0.0	0.0	13609.2
	Mean ²	8064.0	2029.6	1478.3	3140.5	2690.2	9529.5	36311.4	65232.9	43532.3	12111.4	13299.2	14258.5	213112.0
	Median ²	4826.5	5470	4272.5	1154.5	681.5	536.5	536	52	69	96	101	683	102950
136305A	2007-08	0.0	0.0	387.1	1.7	5.2	386.7	76.8	639.4	37.6	0.0	0.0	0.0	1534.5
	Mean ²	4670.3	1126.6	1898.3	2471.1	4206.8	11124.6	12743.2	40446.6	7880.7	4445.4	8249.1	6807.6	106702.4
	Median ²	28	12	14	71	148	801	2528.5	2701.5	893.5	89.5	24	17	42335
136106A	2007-08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1210.4	1550.6	1560.4	453.9	7.7	4783.0
136002D	2007-08	12.8	0.0	0.0	6424.4	1066.7	2025.2	1587.7	67276.4	2297.5	463.3	547.7	4931.8	86633.4

¹ No mean and median discharge volumes are available for GS 135002A, as only the total inflow into Fred Haigh Dam has been modelled

² The January-June mean and median discharge volumes are for the 108 year period 1890-1997, whereas the July-December volumes and the annual volumes are for the 107 year period 1890-1996. The data was taken from the Existing Development case, 137a, of the ROP model

recorded at least one month of no flow (and the majority had many months).

The reporting period started off very dry, with virtually the only flows being from a few dam releases. There were a few small flows in some streams in spring, caused by localised heavy storms (e.g. Auburn River at Glenwood and Burnett River at Mt Lawless).

The majority of streams, however, had no significant flows until rain in February 2008 produced some surface run-off, particularly in coastal areas. This event produced the first flow in the Kolan River at Springfield since November 2005, and in the Burnett River at Eidsvold since April 2006.

After the February 2008 freshes, the base flow in some of the coastal streams held on surprisingly well heading into winter, and they were still flowing in June 2008 (e.g. Kolan River at Springfield). However, further inland the February freshes were much smaller or non-existent, and any base flows were relatively minor and short-lived.

Streamflow discharge plots from five gauging stations are shown in Figure 7.2. Virtually all the flow recorded in the Burnett River at Figtree Creek since about

October 2005 has been from releases from Paradise Dam, as the minor freshes from upstream have been intercepted by the dam.

7.3 Water allocation and use

7.3.1 Overview

The Barker–Barambah, Upper Burnett, Boyne and Bundaberg schemes were under critical water supply arrangements until February 2008 and, as such, the availability of water to medium-priority water allocation holders was significantly restricted until inflows occurred in February 2008.

7.3.2 Water use

Supplemented water

There are 381 high priority supplemented water entitlements across the four water supply schemes, with a total nominal volume of 80 328 ML. Medium-priority supplemented water entitlements total 3949, with a nominal volume of 421 668 ML. Table 7.1 details the supplemented water entitlements for each water supply scheme in the Burnett Basin WRP area.

Figure 7.2 Streamflow discharge (ML/day) for five sites in the Burnett Basin

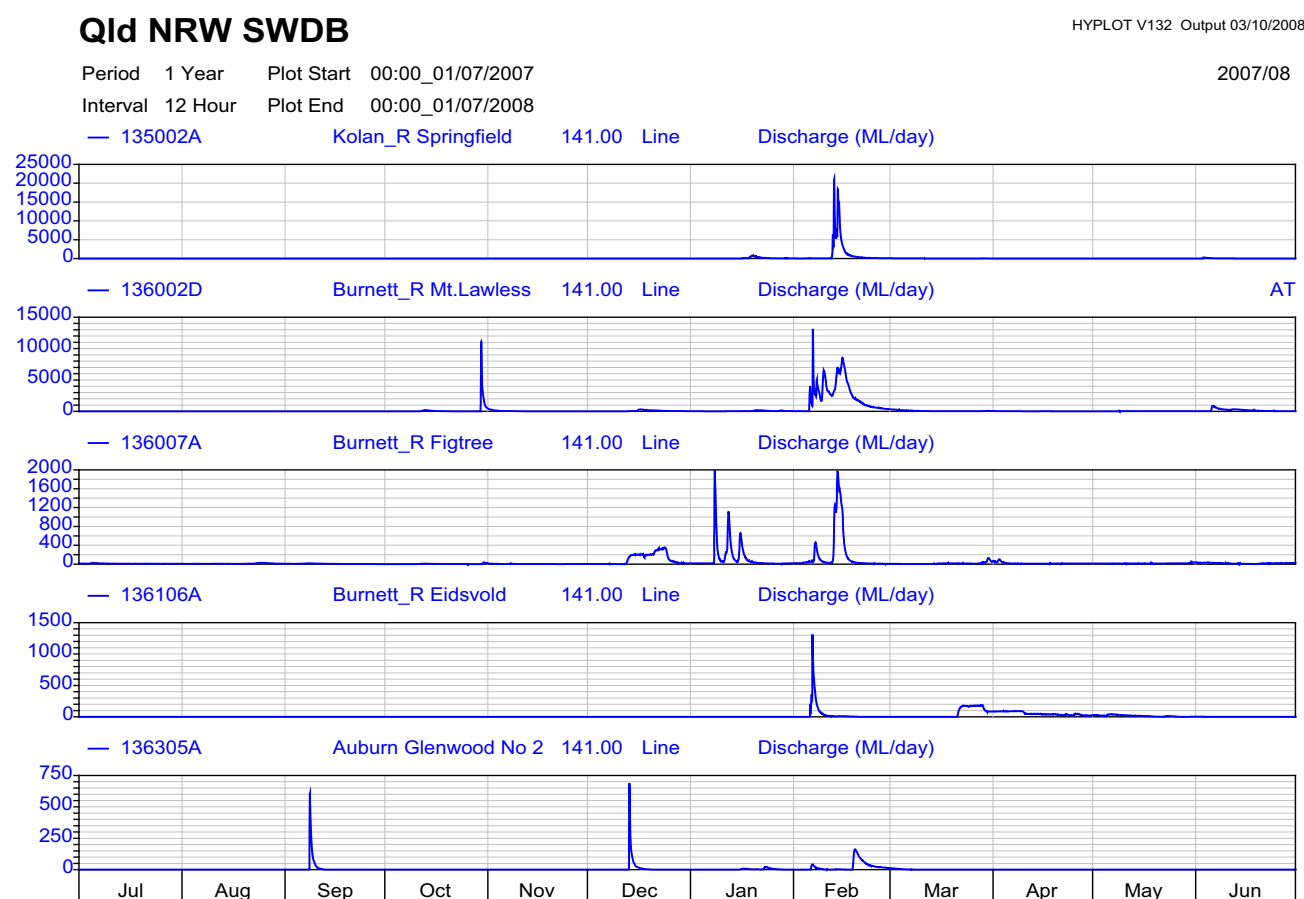


Table 7.1 Supplemented water entitlements in the ROP area

Water Supply Scheme	Number of Entitlements	Nominal Volume
Bundaberg	256 (high)	44,372 (high)
	3092 (medium)	330 380 (medium)
Upper Burnett	4 (high)	1,330 (high)
	558 (medium)	46 800 (medium)
Boyne-Tarong	115 (high)	32,390 (high)
	79 (medium)	13 309 (medium)
Barker-Barambah	6 (high)	2,236 (high)
	220 (medium)	31 179 (medium)
Total	381 (high)	80 328 (high)
	3949 (medium)	421 668 (medium)

Unsupplemented water

There are 441 unsupplemented water allocations across the four surface water management areas with a total nominal volume of 28 266 ML (Table 7.2). There are also 733 groundwater licences in the newly formed CBGMA, with a total nominal volume of 64 920 ML.

There are a further 716 water licences to take water from unsupplemented streams in the WRP area (includes area-based, volumetric limit and water harvesting entitlements).

Table 7.2 Unsupplemented water allocations in the ROP area

Water Management Area	Number of allocations	Nominal Volume (ML)
Boyne and Stuart Rivers Water Management Area	101	8 544
Barker-Barambah Creeks Water Management Area	168	9 722
Lower Burnett and Kolan Rivers Water Management Area	39	2 622
Upper Burnett and Nogo Rivers Water Management Area	133	7 378
Total	441	28 266

Water harvesting

During the reporting period, water harvesting opportunities occurred in February 2008 when flows were experienced in the Kolan, Burnett (downstream of Mundubbera) and Boyne rivers and Barambah Creek. Up to 15 days of opportunity were experienced for some water allocation groups; however, the higher flow groups were significantly less than this. The total

volume harvested across the Burnett Basin during this time was 1426 ML (Table 7.3).

Table 7.3 Water harvesting volumes taken in the ROP area

Water Management Area	Volume taken (ML)
Boyne and Stuart Rivers Water Management Area	77
Barker-Barambah Creeks Water Management Area	282
Lower Burnett and Kolan Rivers Water Management Area	472
Upper Burnett and Nogo Rivers Water Management Area	595
Total	1 426

Movement of water across the water year

Table 7.4 summarises the movement of water across the reporting period.

Table 7.4 Movement of water across the water year

Water Supply Scheme	Carry over (ML)*	Forward draw (ML)#
Bundaberg (ROL)	6 718	0
Upper Burnett (ROL)	Not offered	Not offered
Boyne River and Tarong (ROL)	Not offered	Not offered
Barker-Barambah (IROL)	2990	Not available
Three Moon Creek (IROL)	Not offered	Not available
Total for schemes	9 708	0

* Carry over is water moved from the current year into any future year. #Forward draw is the water brought forward from a future water year to the current water year.

Table 7.5 summarises the announced allocations and volumes of water taken for the reporting period for each water supply scheme. Table 7.6 details the announced allocation changes for the 2007–08 water year for the CBGMA.

Table 7.5 Summary of announced allocations and volumes taken within the Burnett Basin water supply schemes

Water Supply Scheme	Announced Allocation % (priority groups)	Total water available (ML) ¹	Volume taken (ML)	Water taken as % entitled
Bundaberg (ROL)	01.07.07 under CWSA: 85 (high), 3–47 (medium), 0 (high and medium purchased after 02.04.07) ² 22.02.08 (end CWSA): 100 (high), 81 (medium), 100 (new medium)	217 337	69 164	31
Upper Burnett (ROL)	01.07.07 under CWSA: 47–100 (high), 0 (medium) 11.02.08 (end CWSA): 88–100 (high) 29–88 (medium)	18 426	13 551	74 ³
Boyne River and Tarong (ROL)	01.07./07 under CWSA: 50–66 (high) 0 (medium) 18.02.08 (end CWSA): 100 (high), 80 (medium)	43 037	10 987	26
Barker-Barambah (IROL)	01.07.07 under CWSA: 50 (high), 0 (medium) 14.1 7: 100 (high) 14.02.08 (end CWSA): 46 (medium)	16 992	4 919	29 ⁴
Three Moon Creek (IROL) ⁵	GW: 100 (high) GW: 60 (medium) SW: 50–100 (medium)	9 110	3 575	39

¹ Based on announced allocation

² Review of announced allocation rules 7 September 2007 enabled announced allocations to be made for new water allocations purchased after 2 April 2007 and these were announced to be the same as for existing and new

³ Entitlement accessed from bedsands under Burnett Basin ROP Attachment 4.2F, Section 1.2

⁴ Access to waterholes as allowed under the CWSA in the Burnett Basin ROP Attachment 4.3E, Section 1.4.1

⁵ Under an IROL, SunWater is not required to report on total water available given the announced allocation for the year. NRW has estimated the total recorded here based on the reported announced allocation.



Ben Anderson Barrage overflowing in February 2008 (Photo: Tim Riseley)

Table 7.6 Summary of announced allocations within the Coastal Burnett groundwater water management area

Water Management Area System	Polygon	Announced entitlement % June 2007 to March 2008	Announced entitlement % March 2008 to June 2008	Total Water Available (ML) ¹	Volume taken (ML)	Water taken as % entitled
Gooburrum	G 1-4, 8, 9	20	35			
	G7,13-15, 19-22, 28-31, 36, 37, 40-45, 52, 54, 56, 58	65	75			
	G5, 10-12, 16-18, 23-27, 32, 33, 38, 51, 53, 55, 57 (Self Management Areas)	70	85			
Woongarra	W 1-18, 20-27, 32-36, 42-44, 54	40	55	50 760	26 726	53
	W 19, 28-31, 37, 45, 46, 53, 55	50	70			
	W 28-41, 47-52, 56-69, 63-67, 75, 76, 84	60	80			
	W 60-62, 68-74, 77-83, 85-94	70	90			
Elliott (Barns)	E 20, 24, 25	50	65			
	E 18, 21-23	60	70			
	E 1-17, 19	65	80			
	E 26-30	70	80			

¹ Based on announced allocation

7.3.3 Water trading

Water trading continued in the Burnett Basin WRP area in the 2007–08 water year. There were 121 permanent water allocation transfers (separate from land) of supplemented water, with a total volume of 9694 ML and an average price of \$1307 per megalitre. Of these trades, 58 per cent occurred in the Bundaberg Water Supply Scheme, with a total volume of 4026 ML. Permanent transfers also occurred in the Upper Burnett (467 ML), Barker–Barambah (176 ML) and Boyne–Tarong (324 ML) water supply schemes. A further 171 permanent supplemented water allocation transfers occurred with land.

Ten permanent unsupplemented water trading transfers (separate from land) occurred with a volume of 782 ML and an average price of \$318 per megalitre. The majority of this trading occurred in the Barker–Barambah and Boyne–Stuart water management

areas. A further 32 permanent unsupplemented water allocations transfers occurred with land.

The percentages of the total volume of water allocations traded separately to land in the reporting period for supplemented and unsupplemented water were 1.92 and 2.77 per cent respectively.

Table 7.7 details all of the permanent supplemented water allocation transfers that occurred throughout the Burnett Basin WRP area.

There were 250 seasonal water assignments of supplemented water during the reporting period, with a total volume of 12 747 ML. Details of these seasonal water assignments are summarised in Table 7.8.

There were 65 seasonal water assignments in the CBGMA, with a total volume of 1946 ML.

Table 7.7 Permanent supplemented water allocation transfers in the Burnett Basin (separate from land)

Water Supply Scheme	Priority	No. Transfers	Volume Transferred (ML)	(\$/ML) ¹	% turnover ²
Barker–Barambah	High	0	0	-	0
Barker–Barambah	Medium	17	1 776	1 009	5.54
Boyne–Tarong	High	1	1	2 200	0
Boyne–Tarong	Medium	12	3 424	1 781	25.73
Bundaberg	High	8	270	2 276	0.61
Bundaberg	Medium	62	3 756	776	1.13
Upper Burnett	High	0	0	N/A	0
Upper Burnett	Medium	21	467	1 065	1
Total		121	9 694		

¹ This figure is a weighted average price per megalitre and is so used so that the price is not overly distorted by very large and very small prices per ML. A value of '0' indicates transfers for nil consideration (e.g. gifts)

² Percentage of total volume of supplemented water allocations traded separately from land in the WRP area during the reporting period.

Table 7.8 Number and volume of seasonal water assignments

Water Supply Scheme	No.	Total Volume (ML)
Boyne River and Tarong	3	243
Upper Burnett	30	1 046
Barker Barambah	7	276
Three Moon Creek	3	126
Bundaberg	207	11 056
Total	250	12 747

7.4 Water service provider operations

7.4.1 Release from storages

Bundaberg

Under the ROP, releases must be made from Fred Haigh Dam to maintain the downstream storages on the Kolan River, at or above the nominal operating level when the dam is above 42.6 m AHD. No releases were made from Fred Haigh Dam to the Burnett River to meet demands as these schemes were operating in transitional arrangements until 30 June 2008.

Upper Burnett

The critical water supply arrangements were enacted in the Wuruma-Kirar Subscheme from 1 July 2007 to 11 February 2008. During the water year, there were no releases from Wuruma Dam to supply high-priority or medium-priority water users.

Releases were not made from Wuruma Dam to maintain the nominal operating level of Jones Weir or during this period.

In the Jones Subscheme, the critical water supply arrangements were active from 1 July 2007 to 11 February 2008.

Releases were not made to supply medium-priority allocations from Jones Weir during this period. Releases during the water year from Jones Weir were made to supply local demand and meet operational losses only.

John Goleby Subscheme in the 2007–08 water year made releases to supply local demand and meet operating losses.

Releases were not made to supply medium-priority allocations from Claude Wharton Weir between 1 July 2007 and 15 February 2008, as the storage was below the required storage level (89.67 m AHD) and the critical water supply arrangements were in place.

Barker–Barambah

Critical water supply arrangements were in place in the Barker Barambah Water Supply Scheme from 1 July 2007 to 14 February 2008. During this time, releases were only made to supply high priority water users. Releases were not made from Bjelke-Petersen Dam to maintain the nominal operating level of downstream storages during this period. During the remaining period, the triggers did not occur to make downstream compensation flow releases.

Boyne–Stuart

Boyne River and Tarong Water Supply Scheme was operating under the critical water supply arrangements from 1 July 2007 to 18 February 2008, hence no releases were made from Boondooma Dam for downstream users during this period.

Flow management strategies

Under the ROP, releases are to be made from Claude Wharton Weir in November, December and June where inflows exceed 109 ML, 305 ML and 74 ML per day

respectively. During the period extending up until 11 February 2008, Claude Wharton Weir operated under the critical water supply arrangements and hence no releases for this strategy were allowed. There was only one day (1 November 2007) when inflow exceeded the values specified in the ROP during these months. There were two days in June 2008 (5 and 6 June) where inflow exceeded 158 ML per day and releases were made to meet this rule.

Releases are required to be made from Bucca Weir in May if inflows exceed 158 ML per day. Inflow to Bucca Weir was greater than or equal to 158 ML per day during 30 to 31 May 2008. SunWater made releases of 158 ML per day commencing the next working day, 2 June 2008 and continued until 4 June 2008.

Releases made by SunWater, as well as overtopping flows between the period 3 March 2008 to 30 April 2008, contributed to discharges greater than 380 ML per day to fulfil the medium-to high-flow release rule in the ROP.

The ROP requires low flow releases to be made from Paradise Dam in July and December where inflows exceed 20 ML and 75 ML per day respectively. These rules were not required to be activated, as the dam was operating under the critical water supply arrangements from 1 July 2007 to 25 February 2008. As the storage was also below the storage volumes specified in the ROP, no medium-to high-flow releases were made in this water year.



Burnett River upstream Paradise Dam (Photo: Andrew McDougall)

7.4.2 Fishway management

The fishlock at Ned Churchward Weir operated for 357 days of the year. Non-operation was due to a number of faults or high water levels. SunWater provided operational reports for the instances of fishlock non-operation and have addressed the problems.

The fishway at the Kolan Barrage was not operational for 11 days during the months of October and December, as the storage water level of the barrage was below 2.0 m AHD during these periods. This was permitted, as the scheme was operating under

the critical water supply arrangements during this period. The fishway was operational for the rest of the reporting period.

The fishway at Ben Anderson Barrage was not operational for 211 days during the period of June 2007 and February 2008, as the storage water level of the barrage was below 2.2 m AHD. This complied with the critical water supply arrangements. The fishway was operational for the rest of the reporting period in accordance with the ROP.

The ROP specifies that the fishway on Paradise Dam must operate once storage is above 62.0 m AHD and releases or overflows of 14 ML per day are being made. The water level in Paradise Dam did not exceed 62.0 m AHD during the water year. Even though there was not a requirement of the ROP to operate the upstream fishway, SunWater operated the upstream fishway for 133 days for periods between November 2007 and June 2008. The fishway operation was undertaken in consultation with the Department of Primary Industries and Fisheries to further develop effective operating rules for the fishway. The ROL holder may operate the fishway at any time when meeting operational requirements, or at specific times when releases or overflows exceed 14 ML/d.

The Kirar Weir fishway was commissioned on 27 February 2008 after the storage level passed the storage volume trigger for operation on 17 February 2008. Damage occurred to the fishway during commissioning and the fishway was not operational during the water year. Repairs to the fishway have been initiated.

7.4.3 Waterhole management

No instances of drawdown below 0.5 m below the cease to flow level were reported in the relevant waterholes in the ROP area.

7.4.4 Critical water supply strategy

Critical water supply arrangements were triggered from 1 July 2007 for Bundaberg, Barker–Barambah, and Boyne River and Tarong water supply schemes and Wuruma–Kirar, Jones and Claude Wharton subschemes in the Upper Burnett.

Inflows enabled 100 per cent of water to be made available to supply high-priority allocation holders for both the Kolan and Burnett subschemes and effectively ceased the critical water supply arrangements from 22 February 2008.

Kolan Barrage, Ned Churchward Weir and Ben Anderson Barrage were above their nominal operating levels for the entire year. Bucca Weir fell below the nominal operating level of 15.32 ML from 1 December 2007 to 15 January 2008; however, as the scheme was operating under the critical water supply arrangements, the nominal operating level was not required to be maintained during this period.

No releases were made from Wuruma Dam to supply high- or medium-priority water users during the water year. Jones Weir was below the nominal operating level of 108.47 m AHD from 1 July 2007 to 6 February 2008 and from 27 June 2008 to 30 June 2008. No releases were made from Wuruma Dam to maintain the nominal operating level of Jones Weir during this

period, as Wuruma Dam was below its minimum operating level of 200.75 m AHD from 1 July 2007 to 17 February 2008. Kirar Weir operated below the nominal operating level of 151 m AHD from 1 July 2007 to 16 February 2008, and again from 22 April 2008 to the end of the water year.

Critical water supply arrangements for the Jones and Claude Wharton subschemes ceased on 11 February 2008. Releases were not made to supply medium priority allocations from Jones weir while operating under the critical water supply arrangements. Jones Weir storage level was below the nominal operating level of 108.47 m AHD until 6 February 2008. Releases were not made from Wuruma Dam to maintain the operating level of downstream storages and Jones weir again fell below the nominal operating level on 27 June 2008, remaining below this level until the end of the water year. Claude Wharton Weir operated below its nominal operating level of 91.12 m AHD from 1 July 2007 to 30 October 2007.

Barker Barambah Water Supply Scheme operated under the critical water supply arrangements until 14 February 2008, when the water available to supply medium-priority allocation holders was greater than 5 per cent of the total medium-priority water allocations for the scheme. Joe Sippel Weir was below the nominal operating level from 1 July 2007 to 6 February 2008. Silverleaf Weir operated below its nominal operating level of 262.76 m AHD (April–September) from 1 July 2007 to 30 September 2007 and also from 22 to 23 May 2008. The weir also operated below the nominal operating level of 263.76 m AHD (October–March) from 1 October 2007 to 13 December 2007, 19 December 2007 to 8 January 2008, 12 January 2008 to 4 February 2008 and 19, 22 and 23 March 2008.

Critical water supply arrangements for the Boyne River and Tarong Water Supply Scheme ceased on 18 February 2008. During the period in which the critical water supply arrangements were effective, no releases were made to supply water users downstream on the Boyne River. Releases were made for high-priority water users on the Tarong pipeline. Medium-priority users were permitted waterhole and bedsands access as per the critical water supply arrangements. Boondooma Dam remained above the minimum operating level of 252 m AHD for the entire water year.

Refer to the NRW website for more information on critical water supply arrangements for the Burnett Basin (www.nrw.qld.gov.au/wrp/burnett.html).

7.4.5 Impact monitoring

SunWater reported no cases of bank slumping, bank erosion or fish stranding in the ponded area or immediately downstream of storages in the Upper Burnett, Bundaberg, Barker–Barambah, and Boyne River and Tarong water supply schemes.

7.4.6 Non-compliance with the resource operations plan

Minor instances of non-compliance with the ROP, associated with the provision of some water quality data were identified. This was due to the resource operations licence holder's interpretation of the department's newly revised Water Monitoring Data Collection Standards (V2.1, March 2007). Information was forwarded to SunWater clarifying the intention of the standards, with a list detailing monitoring required at particular storages. The licence holder subsequently complied with the provision of water quality data.

Other non-compliance issues were identified. Investigations indicated these were associated with infrastructure and mechanical failures. Appropriate actions were undertaken by the licence holder to rectify these matters.

None of the non-compliance issues adversely affected the required outcomes of the WRP.

7.5 Ecological monitoring and assessment

7.5.1 Ecological assets identified for further monitoring

Ecological assets prioritised for monitoring in the Burnett catchment include the Queensland lungfish, the laceplant and Queensland laceplant, waterholes as refugia and estuaries. A full list of ecological assets, along with details of whether they were included in the monitoring program, can be found in Attachment A (Burnett section).

7.5.2 Stage of monitoring and research activities

During 2007–08, monitoring focused primarily on determining interaction of mangrove recruitment and freshwater flows, lungfish egg sampling and mapping the interaction of groundwater and surface water in the Elliott River subcatchment. Tables 1 and 2 in Attachment A (Burnett section) show the links between these monitoring programs and the ecological outcomes of the WRP.

Preliminary information from the lungfish egg

sampling confirms the lack of egg laying by this species in impoundments. The majority of egg samples were collected between September and December and were found in all riverine sections between Paradise Dam downstream to below Ned Churchward Weir on the Burnett River. The highest egg counts were found at sites immediately below storages, with the timing of these collections being after modest flow events. This sampling has expanded to include the Mary River in 2008 to further expand the department's knowledge of lungfish spawning and the linkages to critical flows.

Mapping of mangrove area changes since the early 1940s has revealed that there is a greater area of mangroves present in the Kolan, Baffle, Burnett and Elliott River systems now than 60 years ago. Further analysis of the data suggests a correlation between some key flow statistics such as the mean annual flow and the abundance and recurrence of small, but frequent floods (i.e. such as those that occur on average every one to two years). Sedimentation driven by land clearing appears to be an overriding driver for mangrove colonisation. This work will be further analysed and will be submitted for publication in 2009.

Other monitoring activities included the mapping of waterholes in the Elliott River. This activity was used to determine the amount of water drawdown by irrigation and determine the potential level of risk to ecological assets in this system. The water level in the waterholes has been plotted against groundwater levels to determine periods of interaction between the water sources and the level of connectivity. A CSIRO project initiated in late 2007 has built upon this preliminary monitoring and is analysing groundwater and surface water quality parameters to determine the spatial and temporal extent of the interaction. This project will continue for a full year.

7.6 Effectiveness of the plan

This is the fifth consecutive year of implementing the Burnett Basin WRP through the ROP.

Commencement of the Burnett Basin WRP review will occur in the 2008–09 reporting period. The information collated in the 2007–08 reporting period indicates that general outcomes of the plan are being addressed through the ROP.

Water allocation, water use and water trading data collated during the reporting period indicates that the water resources in the Burnett Basin WRP area are being allocated and managed in accordance with the WRP.

Through the ROP implementation process in 2007–08,

Through the ROP implementation process in 2007–08, water meter installation for unsupplemented water entitlements was carried out in the Boyne and Stuart rivers. This is in line with the implementation schedule of the Burnett Basin WRP by metering the volume of water taken under authorisations for this part of the ROP.

The amendment to the WRP in 2007–08 to include subartesian water of the Coastal Burnett Groundwater Area will further address issues of groundwater quality and availability across the Burnett Basin WRP area and enhance the sustainable management of this resource. The draft ROP amendment for this is currently being prepared. The ecological monitoring will be focused on determining the risks to ecological assets dependent on groundwater water resources. Some initial monitoring has been conducted in Kinkuna National Park to determine the level of dependence of ecological assets and the depth to the water.

8. Calliope River Water Resource Plan

8.1 2007–08 highlights

Highlights in the Calliope River Water Resource Plan (WRP) Area during the reporting period included the following:

- The Calliope River Basin ROP was released in May 2008.
- The plan allowed for the conversion of licences to specify a volume and a rate of take.
- Operating licences were metered during the reporting period.

8.2 Overview

The Calliope River WRP was approved in December 2006. It applies to water in a watercourse, lake or spring in the Calliope River Basin and includes any dam or weir constructed in or over a watercourse, lake or spring.

The Calliope River WRP is implemented through the

Calliope River Resource Operations Plan (ROP), which was initially approved in May 2008. The WRP, ROP and a map of the catchment can be viewed by visiting the NRW website <www.nrw.qld.gov.au/wrp/calliope>.

The effectiveness of the WRP and the ROP in achieving the outcome for the sustainable management of water is discussed in section 8.4.

8.2.1 Changes to the plan

There have been no amendments to the Calliope River WRP in the reporting period.

8.2.2 Streamflow

The Calliope River Basin received two significant run-off periods (Figure 8.1) this season resulting in a well above median flow volume (Table 8.1), with the largest event peaking at 94 800 megalitres per day (ML/day) during February. For the December event, 141 mm of rain was recorded at the NRW gauging station, 132001A on the Calliope River at Castlehope, whereas during the February events 220 mm fell over three days. Flow volume was significantly higher this year as rainfall intensities were high enough for run-off to exceed transmission losses.

Figure 8.1 Streamflow on the Calliope River at Castlehope

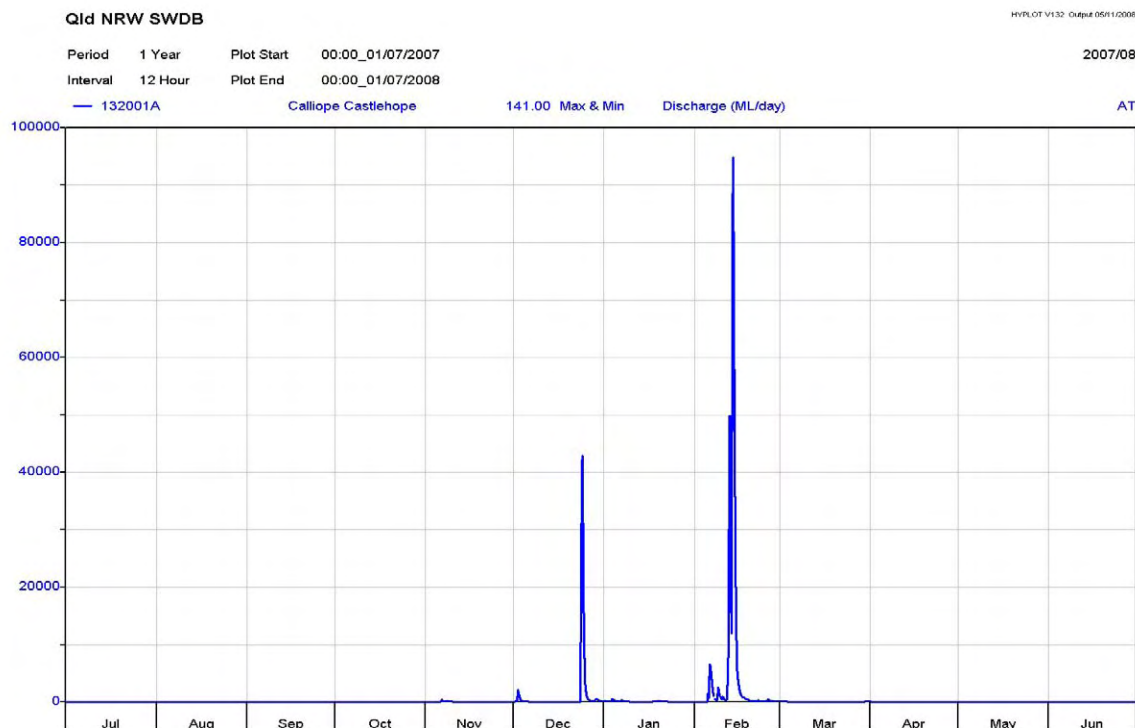


Table 8.1 Annual flows in the Calliope River

Gauging station	Median annual flow (ML)	Annual flow 2006–07 (ML)	Annual flow 2007–08 (ML)
132001A Castlehope	92 000	2 960	183 000

8.3 Water allocation and use

8.3.1 Water use

Unsupplemented water

At the end of the reporting period, there were 51 unsupplemented surface water entitlements in the WRP area with a total nominal volume of 3786 ML. There is no data available for unsupplemented water use.

Overland flow

The Calliope River WRP regulates overland flow within the Calliope River catchment. There have been no overland flow notifications during the reporting period.

8.3.2 Ecological assets identified for further monitoring

A full list of ecological assets, along with details of whether they were included in the monitoring program can be found in Attachment A (Calliope section).

During 2007–08, the department focused on ecological asset selection. The monitoring program and asset selection is currently being considered and viewed by stakeholders within the Calliope River WRP area. In the 2008–09 water year, it is anticipated that waterhole monitoring—including the monitoring of drawdown of waterholes—will be initiated in the lower freshwater reaches of the Calliope River.

8.4 Effectiveness of the plan

This is the first year of operation of the Calliope River ROP, with the ROP being implemented for only a month of the reporting period. Effectiveness of this plan will continue to be assessed to ensure that outcomes of the plan are being met.



Calliope River (Photo: NRW)

9. Cooper Creek Water Resource Plan

9.1 2007–08 highlights

Highlights in the Cooper Creek Water Resource Plan (WRP) Area during the reporting period included the following:

- The moratorium on new overland flow works, which came into effect on 22 April 2004, continued to be in place.
- The planning process to prepare a new draft water resource plan has commenced.

9.2 Overview

The Cooper Creek WRP was approved in February 2000. It applies to water in a watercourse, lake or spring and subartesian water hydraulically connected to a watercourse (not connected to artesian water) in the Cooper Creek catchment. The main watercourses in the catchment include the Alice, Barcoo, Darr and Thomson Rivers as well as Torrens Creek and Cooper Creek.

The Cooper Creek WRP is not implemented through a resource operations plan (ROP), but through the rules stated by the WRP. This is because the WRP was developed under the previous *Water Resource Act 1989*. The WRP and a map of the catchment can be viewed by visiting the NRW website <www.nrw.qld.gov.au/wrp/cooper>.

The current plan expires on 1 September 2010 and a new plan must be gazetted before that time. NRW has begun the process during this reporting period.

The effectiveness of the WRP in achieving the outcome for the sustainable management of water is discussed in section 9.4.

9.2.1 Changes to the plan

There have been no amendments to the Cooper Creek WRP during the reporting period.

A notice of intention to prepare a draft WRP was announced on 11 July 2008 in accordance with the 10-year review.

9.2.2 Streamflow

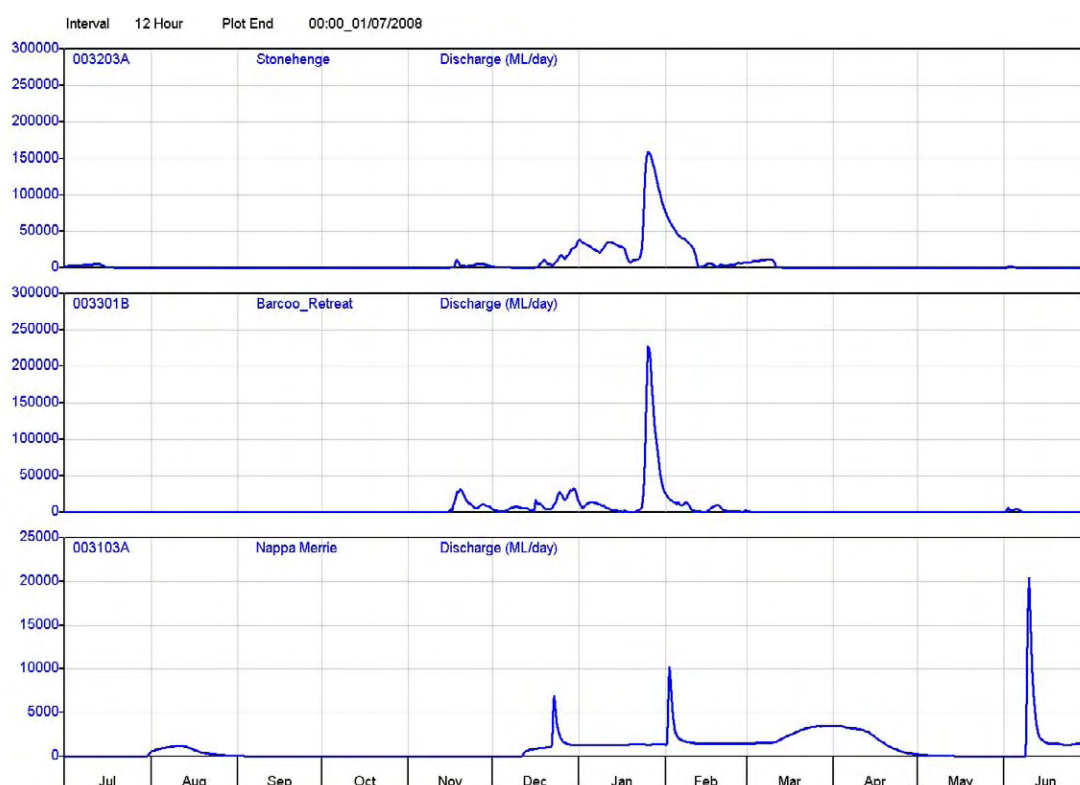
The Cooper Creek catchment area covers a vast expanse of arid country originating from the Thomson River inflowing streams in the north, near Torrens Creek, down through Longreach, to the Barcoo inflowing streams in the east, encompassing catchment areas around Tambo and Barcaldine. Although significant flows originate in these streams, much of the volume is lost by the time water reaches the Cooper Creek proper at Nappa Merie (Table 9.1), due to high transmission losses associated with floodplain flooding.

Above-median flows were received at all end-of-system gauging stations, with the highest flow of 230 000 ML recorded at Retreat in January (Figure 9.1). Good June rainfall over the lower Cooper Creek catchment area resulted in significant local run-off at Nappa Merie.

Table 9.1 Annual flows in the Cooper River catchment

Gauging station	Median annual flow (ML)	Annual flow 2006–07 (ML)	Annual flow 2007–08 (ML)
003301B Barcoo–Retreat	470 000	390 000	1 700 000
003203A Thomson–Stonehenge	1 500 000	890 000	2 600 000
003103A Cooper–Nappa Merrie	280 000	430 000	360 000

Figure 9.1 Streamflow (ML/d) plots for Thomson River, Barcoo River and Cooper Creek



9.3 Water allocation and use

9.3.1 Water use

The Cooper Creek WRP has no supplemented water allocations in the Cooper Creek WRP area.

The proportion of use in the Cooper Creek catchment against overall flow is small, with many of the water entitlements not currently used or developed.

The main proportion of use is stock and domestic purposes with extractions for irrigation and industrial purposes. The towns of Longreach, Stonehenge, Jundah, Windorah, Isisford, Ilfracombe and Yaraka all

source surface water for town water supply.

Most licensed current extraction occurs in the upper and lower Thomson subcatchments, with a lesser amount in the Alice and Barcoo River catchments.

Unsupplemented water

Unsupplemented water licences for non-stock domestic purposes are defined volumetrically or for some irrigation entitlements in terms of the area authorised. Tables 9.2 and 9.3 set out existing entitlements.

Table 9.2 Existing entitlements to take water

Subcatchment	Stock and domestic (riparian works access)	Stock and domestic (licences)	Town water supply	Irrigation	Water harvesting
Total	59	32	7	26	2

Table 9.3 Existing annual volumetric and area entitlements (licences to take water)

Subcatchment	Town water supply	Irrigation	Water harvesting
Total	3 611ML	1 165 ha	100 ML

Water harvesting

There are two water harvesting entitlements. One has a 100 ML entitlement and the other does not have a defined volumetric or area allocation. There are a small number of large entitlements which are subject to flow conditions.

Overland flow

A moratorium notice on new overland flow works was announced on 22 April 2004. This notice was still in effect during the 2007–08 reporting period. Provisions for overland flow will be considered in the proposed draft WRP following community consultation.

Groundwater

The current plan only regulates groundwater that is hydraulically connected to a watercourse, excluding groundwater connected to artesian water (which is covered by the Great Artesian Basin WRP).

9.4 Effectiveness of the plan

There is a low level of water extraction in the catchment. This is based on low levels of development and the current WRP provisions and overland flow moratorium restricting certain uses of water. These factors maintain the natural flows and are consistent with the objectives of the plan.

10. Fitzroy Basin Water Resource Plan

10.1 2007–08 highlights

Highlights in the Fitzroy Basin Water Resource Plan (WRP) Area during the reporting period included the following:

- Critical water supply water sharing rules were activated in the Dawson Valley Lower Subscheme from 1 July 2008.
- An audit of the 2006–07 Nogoa–Mackenzie Water Supply Scheme took place, and results have not been released to date.
- Fairbairn Dam outlet upgrade was completed, in accordance with section 1.2 of Attachment 9.1 of the Fitzroy Basin ROP.
- First post-winter flow was activated for the Dawson and the Nogoa–Mackenzie during the reporting period.
- Fairbairn Dam overtopped for the first time since 1990.
- Seasonal assignment water in the Nogoa Mackenzie Water Supply Scheme was used to dilute water discharged from the Ensham Mine after the January flood.

10.2 Overview

The Fitzroy Basin WRP was approved in December 1999. It applies to water in a watercourse, lake, spring or overland flow in the Fitzroy Basin, and does not include groundwater. The WRP area includes the Fitzroy, Dawson, Comet, Nogoa, Mackenzie and Isaac–Connors subcatchments.

The Fitzroy Basin WRP is implemented through the Fitzroy Basin Resource Operations Plan (ROP), which was initially approved in 2004. The WRP, ROP and a map of the catchment can be viewed by visiting the NRW website <www.nrw.qld.gov.au/wrp/fitzroy>.

The effectiveness of the WRP and the ROP in achieving the outcome for the sustainable management of water is discussed in section 10.6.

At the time of writing this report, the dewatering of flooded mine pits at Ensham Coal Mine has resulted in water quality impacts, such as a rise in sodium and salinity levels in the Fitzroy River system. The extent of the impacts is currently being investigated (led by the Environmental Protection Agency) and will not be included in this year's edition of the reports. More information on the results of this study and the possible impacts will be reported on in the 2008–09 annual report.

10.2.1 Changes to the plan

- No amendments were made to the Fitzroy Basin WRP during the reporting period.
- A notice of intention to prepare a draft WRP was announced on 6 June 2008.

10.2.2 Streamflow

During this annual reporting period, two significant run-off events occurred in the Fitzroy River, with exceptional events in Theresa Creek and Nogoa River systems (Figure 10.1) in January. Sustained rainfall from the Gemfields to Bogantungan range, resulted in major flooding in the Emerald district. A large event originating in the Isaac–Connors system preceded the arrival of waters from the Emerald area resulting in major flooding of the Rockhampton area, although not reaching the 1988 or 1991 levels.

Streamflows in the Dawson River were insignificant compared to flows from the rest of the Fitzroy catchment although a peak flow of 40 000 megalitres per day (ML/d) was recorded at Beckers (Table 10.1). Other peak flow rates include 370 000 ML/day at Theresa Creek at Gregory Highway, 526 000 ML/d at Fitzroy River at Eden Bann Weir, and 648 000 ML/d at Mackenzie River at Coolmaringa. As a result, annual volumes exceeded the median figures for all stations (Table 10.1).

Figure 10.1 Streamflow (ML/d) plots for Fitzroy, Mackenzie, Theresa, Isaac, and Dawson rivers

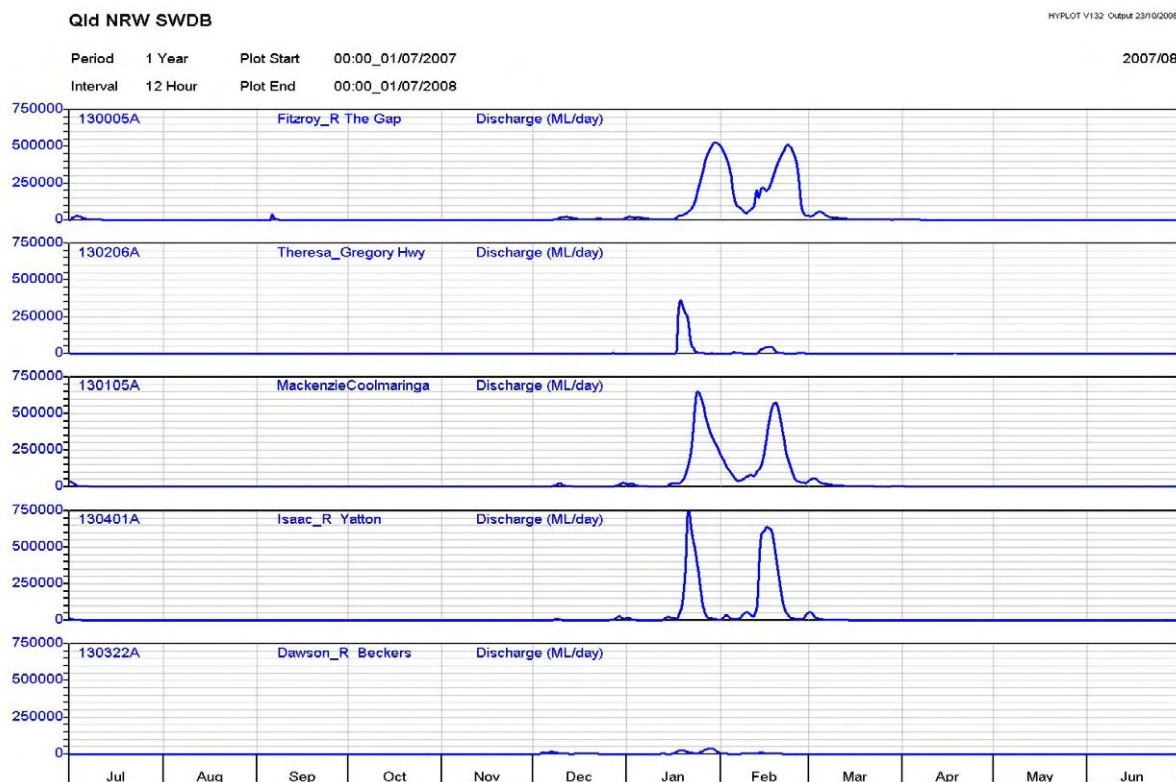


Table 10.1 Annual flows in the Fitzroy River catchments

Gauging station	Median annual flow (ML)	Annual flow 2006–07 (ML)	Annual flow 2007–08 (ML)
130322A Beckers River	370 000	890 000	12 100 000
130206A Theresa Creek	130 000	32 000	1 500 000
130401A Isaac River	600 000	1 070 000	8 100 000
130105A Mackenzie River	1 600 000	1 100 000	10 600 000
130005A Fitzroy River	2 600 000	890 000	12 100 000

10.3 Water allocation and use

10.3.1 Water use

Supplemented water

There are 1124 supplemented water entitlements in the Fitzroy Basin WRP, with a nominal volume of 387 869 ML.

Table 10.2 Summary of announced allocations and volumes taken within the Fitzroy Basin water supply schemes

Water Supply Scheme	Announced Allocation % (priority groups)	Total water available (ML) ¹	Volume taken (ML)	Water taken as % entitled				
Nogoa-Mackenzie	High Priority	274 602	108 292	39.44				
	1 July 2007: 100%							
	4 December 2007: 100%							
	11 December 2007: 100%							
	19 December 2007: 100%							
	2 January 2008: 100%							
	Medium Priority							
	1 July 2007: 0%							
	4 December 2007: 34%							
	11 December 2007: 67%							
	19 December 2007: 82%							
	2 January 2008: 100%							
	Dawson Valley (upper subscheme) ²				High Priority	62 531	33 095	53
					1 October 2007: 94%			
					9 November 2007: 100%			
3 December 2007: 94%								
7 January 2008: 100%								
3 April 2008: 100%								
1 July 2008: 100%								
8 August 2008: 100%								
Medium A Priority								
1 October 2007: 0%								
9 November 2007: 7%								
3 December 2007: 63%								
7 January 2008: 69%								
3 April 2008: 80%								
1 July 2008: 100%								
8 August 2008: 71%								
Medium Priority								
1 October 2007: 0%								
9 November 2007: 0%								
3 December 2007: 43%								
7 January 2008: 49%								
3 April 2008: 60%								
1 July 2008: 84%								
8 August 2008: 91								

Dawson Valley (lower subscheme)	High Priority	n/a	n/a	n/a
	1 October 2007: 62%			
	3 December 2007: 100%			
	1 July 2008: 100%			
	7 August 2008: 100%			
	Medium Priority			
	1 October 2007: 0%			
	3 December 2007: 71%			
1 July 2008: 95%				
7 August 2008: 74%				
Lower Fitzroy	High Priority	28 603	16 990	59.4%
	1 July 2007: 100%			
Fitzroy Barrage	Medium Priority			
	1 July 2007: 100%			
Fitzroy Barrage	High Priority	62 066	21 484	34.6%
	1 July 2007: 100%			
Fitzroy Barrage	Medium Priority			
	1 July 2007: 100%			

¹ Based on announced allocations.

² Dawson Valley water year is from October 2006 to September 2007

Unsupplemented water

In the ROP area there are a total of 209 unsupplemented water allocations with a nominal volume of 91 953ML and a volumetric limit of 120 020.

There are a total of 786 unsupplemented water entitlements within the WRP area, shown in Table 10.3.

Table 10.3 Unsupplemented water entitlements in the WRP area

Number of Entitlements	Nominal Volume (HA)	Nominal Entitlement (ML)
326 (area based)	12 270	
102 (volumetric)		11 058
358 (no volume or area specified)		

Water harvesting

Water harvesting values are summarised in Table 10.4.

Table 10.4 Water harvesting volumes taken in the ROP area

Water management area	Volume taken (ML)
Fitzroy Barrage (Zone A)	335
Dawson	21 790
Nogoa–Mackenzie	6 953
Total	29 078

Overland flow

A summary of overland flow notifications is detailed in Table 10.5.

Table 10.5 - Overland flow notifications

Purpose	Notifications	Volume(ML)
Stock and domestic only	3	37
Other	18	7 374

Movement of water across the water year

The storage level of Fairbairn Dam at 1 July 2008 was 203.56 m AHD with a permissible carryover volume of 150 000 ML as per the Fitzroy Basin ROP. Carryover and forward draw amounts are shown in Table 10.6.

Table 10.6 Movement of water across the water year

Water supply scheme	Carryover (ML)*	Forward draw (ML)#
Nogoa–Mackenzie	130 036	0
Lower Fitzroy	0	18
Fitzroy Barrage	0	0.08
Dawson Valley	5 517	0

* Carryover is water moved from the current year into any future year.

Forward draw is the water brought forward from a future water year to the current water year.

10.3.2 Water trading

There were 29 permanent supplemented water allocation transfers (separate from land) over 2007–08 in the Fitzroy Basin, with a weighted average price of \$1494 per megalitre.

Permanent water allocation transfers with land totalled 45, with a 4.95 per cent turnover. Table 10.7 details permanent supplemented water allocation transfers in the Fitzroy.

Three transfers of permanent unsupplemented water allocations (separate from land) took place, with a weighted average price of \$229 per megalitre.

Table 10.7 Water trading summary

Water supply scheme	Priority	Number of transfers	Volume transferred (ML)	Price* (\$/ML) ¹	Turn-over ² (%)
Dawson Valley	High	0	0		0
Dawson Valley	Medium	3	390	2 000	1.06
Dawson Valley	Medium A	1	37	2 081	0.19
Fitzroy Barrage	High	0	0		0.00
Fitzroy Barrage	Medium	9	216	1 858	1.86
Lower Fitzroy	High	0	0		0.00
Lower Fitzroy	Medium	0	0		0.00
Nogoa–Mackenzie	High	0	0		0.00
Nogoa–Mackenzie	Medium	16	5 644		2.96

¹ This figure is a weighted average price per megalitre. A value of '0' indicates transfers for nil consideration, e.g. gifts.

² Percentage of total volume of supplemented water allocations traded separately from land during the reporting period.

Seasonal water assignments

There were no supply difficulties associated with the delivery of the seasonal assignments across all schemes during the 2007–08 water year. In the Fitzroy Barrage there was a 37 per cent decrease in the number of seasonal water assignments. Additionally, the assignments in the Lower Fitzroy were predominately for customers taking water from the Stanwell pipeline for agricultural purposes. Table 10.8 details the number and volumes related to seasonal water assignments in the Fitzroy Valley WRP area.

Table 10.8 - Seasonal water assignments summary

Scheme	Number	Assigned volumes (ML)
Dawson Valley	56	5 285
Nogoa Mackenzie	167	30 025
Fitzroy Barrage	12	243
Lower Fitzroy	10	85

- The first post-winter flow announcement for the Upper and Lower Mackenzie was approved on 6 December 2007 following widespread storms in the upper Nogoa catchment from 25 November 2007.
- The first post-winter flow announcement for the Upper and Lower Dawson was approved on 3 December 2007 following widespread storms in the upper Dawson catchment from 26 November 2007.
- The first post-winter flow announcement for the Nogoa–Mackenzie was approved on 6 December 2007 following widespread storms in the upper Nogoa catchment from 25 November 2007.

Seasonal base flow

The ROP specifies seasonal base flow management strategies for certain storages in the Dawson Valley, Nogoa–Mackenzie and Fitzroy barrage schemes. Under these management strategies, inflows are passed through the storages under conditions specified in the ROP. Inflows are passed via storage outlet works and by overtopping.

The implementation of seasonal base flow management strategies was satisfactory in all schemes.

10.4.2 Fishway management

The ROP specifies the fishway operation is permitted within the Fitzroy Basin WRP area.

The Barrage Fishway operated throughout the reporting period, except for 20 days when work was undertaken to repair extensive damage to the fishway caused by the January and February flooding in the Fitzroy River. The Eden Bann Weir (Lower Fitzroy) Fishway was operational for 193 days, and the Moura Weir (Dawson Valley) Fishway was operational for 124 days and the Neville Hewitt Weir (Dawson Valley) was operational for 110 days.

10.4 Water service provider operations

10.4.1 Release from storages

First post winter flow

Under the ROP, the chief executive activates the first post-winter flow management strategies in the Dawson Valley and Nogoa–Mackenzie water supply schemes when streamflow and meteorological conditions indicate that a flow event will meet specific criteria. When the strategy is activated, natural flows are passed through and over storages for environmental purposes. First post-winter flow announcements in the Fitzroy are as follows:

10.4.3 Waterhole management

The Barrage, Eden Bann Weir and Tartus Weir sustained frequent overflows during the reporting period, ensuring waterhole trigger levels were not reached.

As required by the ROP, the ROL holder reported that no notifications of waterhole drawdown were received from Nogoia-Mackenzie or Lower Fitzroy customers.

10.4.4 Critical water supply strategy

Critical water supply water sharing rules were activated at the beginning of 2007–08 for the Nogoia Mackenzie Water Supply Scheme, with the medium-priority announced allocations being zero. Many of the medium-priority customers held carryover from the previous year.

10.4.5 Impact monitoring

There were no incidents of bank slumping, erosion and fish stranding in the Nogoia Mackenzie Water Supply Scheme linked to storage operations. However, the resource operations licence holder noted that there had been significant erosion downstream of Bedford and Bingegang Weirs related to the February 2008 floods.

10.4.6 Non-compliance with the resource operations plan

During the 2007–08 water year, the resource operations licence holders reported instances of non-compliance with the ROP relating to operation of infrastructure, monitoring and reporting.

The licence holders are continuing to improve reporting and operating practices. The chief executive is reviewing current monitoring and reporting requirements of resource operations licence holders. When complete, the chief executive will be amending the ROP where necessary to clarify the licence holder obligations.

10.5 Ecological monitoring and assessment

10.5.1 Ecological assets identified for further monitoring

The tables in Attachment A (Fitzroy section) show the ecological assets identified as having a critical link to flow in the Fitzroy Basin WRP area.

10.5.2 Stage of monitoring and research activities

The Fitzroy Basin WRP provides that, in relation to ecological outcomes, water in the plan area must be managed in an integrated and sustainable way that seeks to achieve a balance in providing for environmental water requirements for natural ecosystems in the plan area.

Ecological monitoring of the Fitzroy Basin WRP area has been undertaken since 2000, when the Department of Primary Industries and Fisheries conducted the Environmental Flows for Subtropical Estuaries research project. This project investigated the effects of flow on recruitment and growth of barramundi, banana prawns and threadfin salmon. The project has been completed and ran until June 2006.

NRW has continued monitoring programs (since 2003) for the following species to identify spawning requirements and specifically the flow and water temperature requirements:

- golden perch (*Macquaria ambigua orientalis*)
- leathery grunter (*Scortum hillii*)
- Hyrtl's tandan (*Neosilurus hyrtlilii*)
- black tandan (*Neosilurus ater*).

Due to the importance of waterholes as places of refuge for aquatic species in times of low flow, they are being monitored for persistence and depth.

10.6 Effectiveness of the plan

The Fitzroy Basin WRP is currently undergoing its 10 year review where the effectiveness of water planning within the catchment will be assessed in detail.