

3.0 WATER

3.1 WATER INTRODUCTION

In this section water refers to the rivers, creeks and streams, ground water and floodplains within the Tamworth Regional Council area. The focus is on the physical and chemical aspects of these aquatic systems, the use of water within these catchments for human consumption and waste disposal and the health of these river and creek systems.

The importance of water, aquatic systems and riverine environments include the range of ecological, chemical and geomorphic functions provided within the upper Namoi Catchment covered by the Council area including –

- ♦ Nutrient cycling,
- ♦ Linking aquatic and terrestrial food chains,
- ♦ Influencing flooding patterns,
- ♦ Moderating ground water changes,
- ♦ Maintaining biodiversity and
- ♦ A range of recreational functions.

The rivers, creeks and streams which make up the catchment have intrinsic and extrinsic values including aesthetic, recreational, functional, social and economic values some of which are difficult to quantify. However, the value of protecting water supplies, water qualities and waterways is accepted by the whole community.

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3.2 STREAMFLOW

The rainfall figures in Section 2 showed the variability of rainfall across the region during 2004-2005. This is reflected in the stream and riverflows across the catchment. The following figures show the high rainfall in the tableland areas which feed the MacDonald and Peel Rivers in the second half of 2004, the lower rainfall in the Ironbark Creek and Manilla River catchment between Barraba and Manilla and the major flood event in the Ironbark Creek, Manilla and lower Peel Rivers in December 2004. The Department of Infrastructure, Planning and Natural Resources (DIPNR), (now the Department of Natural Resources) provided the data.

Figure 3.1 MacDonald River flow at Woolbrook (Figure supplied by DIPNR)

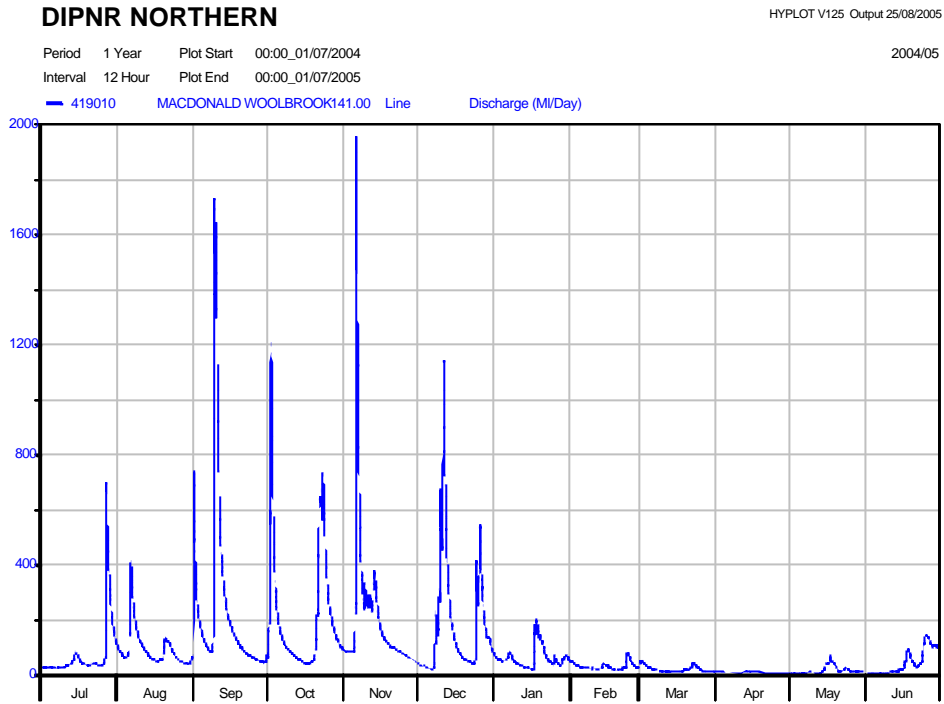


Figure 3.2 MacDonald River flow at Retreat (Figure supplied by DIPNR)

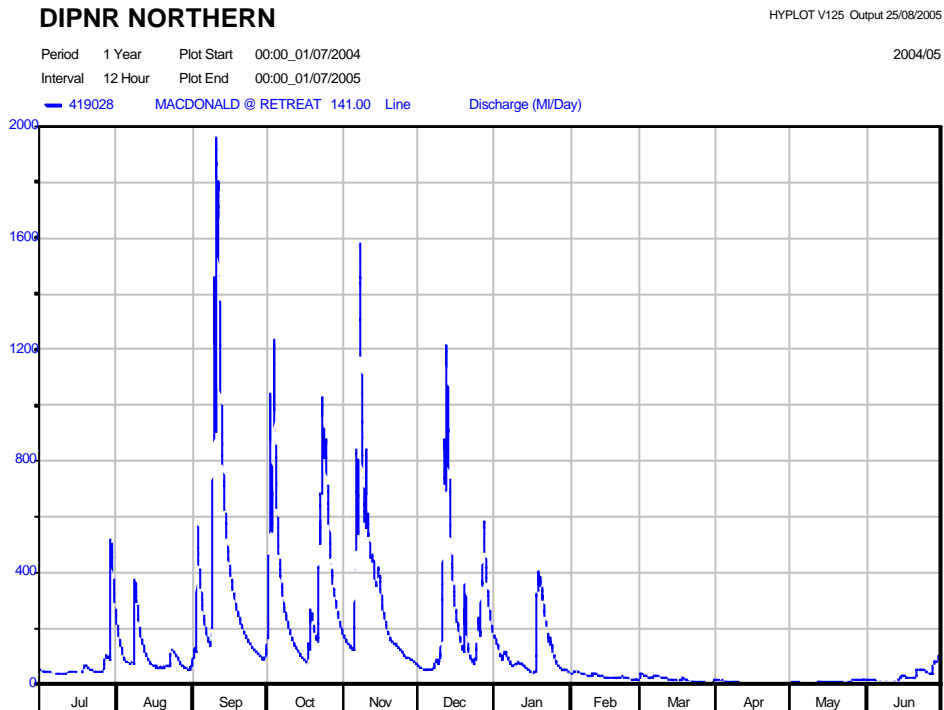


Figure 3.3 Peel River flow at Taroona (Figure supplied by DIPNR)

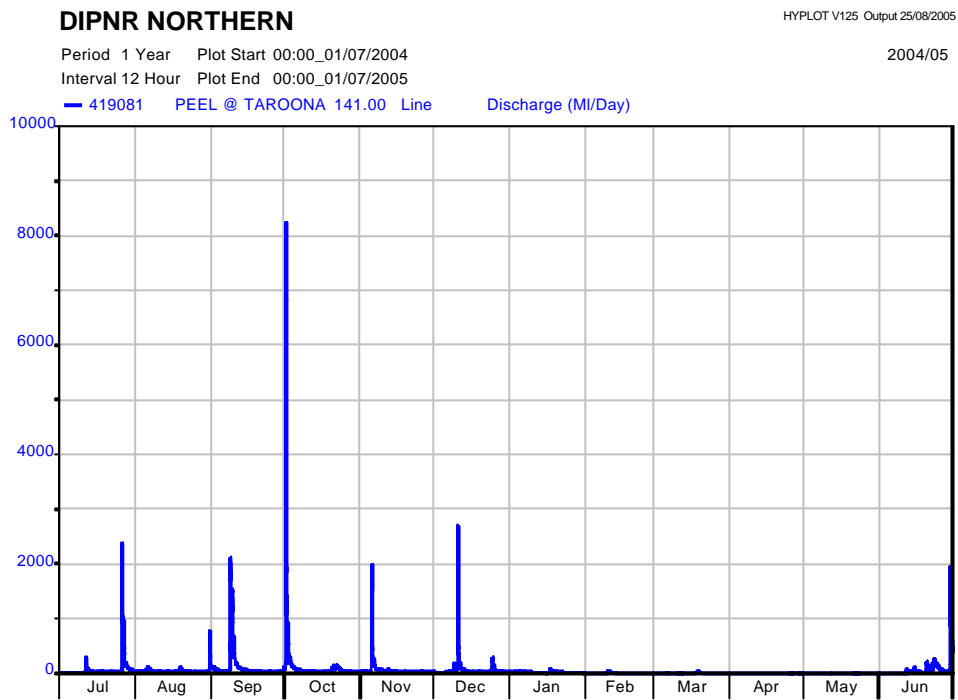


Figure 3.4 Peel River flow at Paradise, Tamworth (Figure supplied by DIPNR)

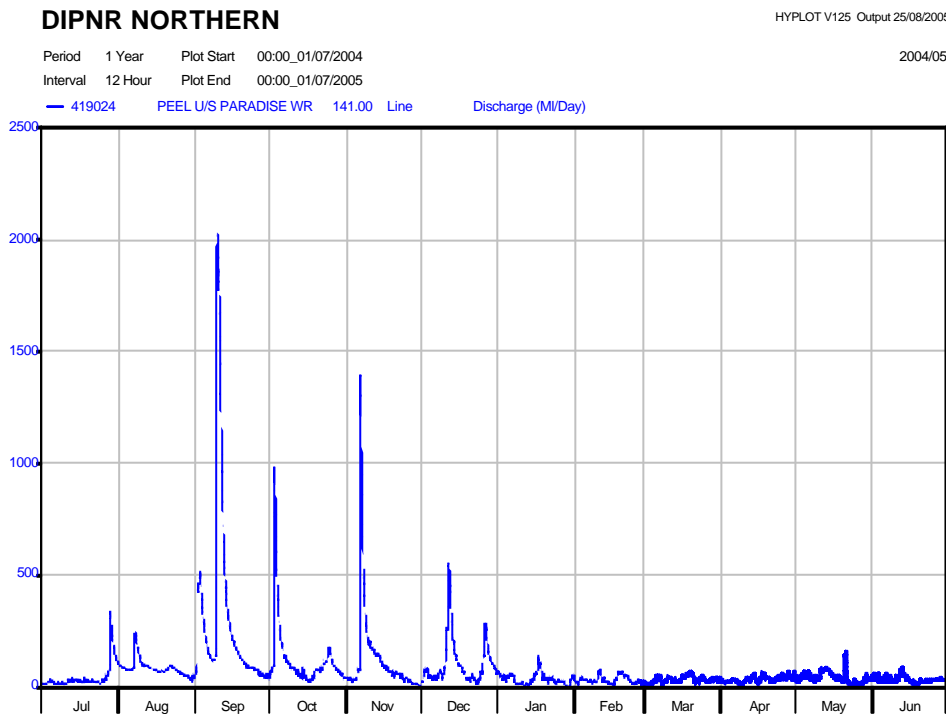


Figure 3.5 Peel River flow at Carrol Gap(Figure supplied by DIPNR)

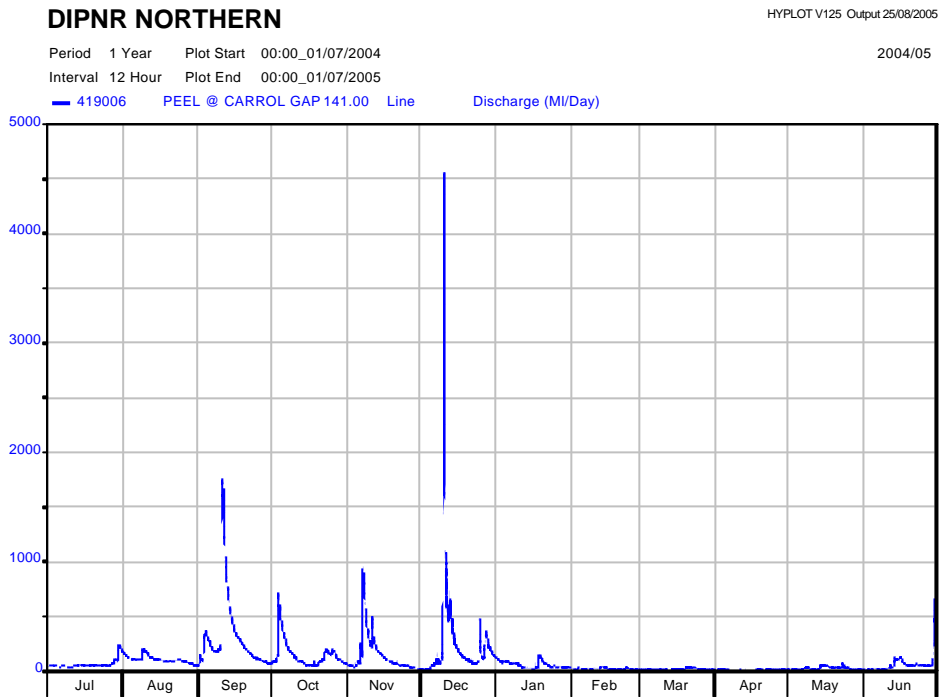


Figure 3.6 Goonoo Goonoo Creek at Meadows Lane (Figure supplied by DIPNR)

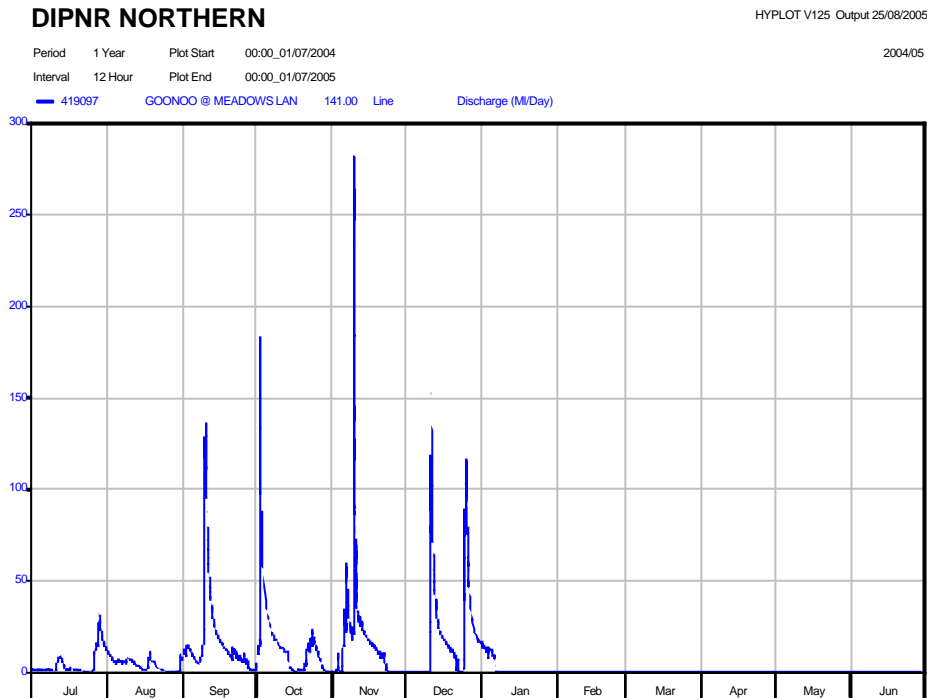


Figure 3.7 Ironbark Creek flow at Woodsreef (Figure supplied by DIPNR)

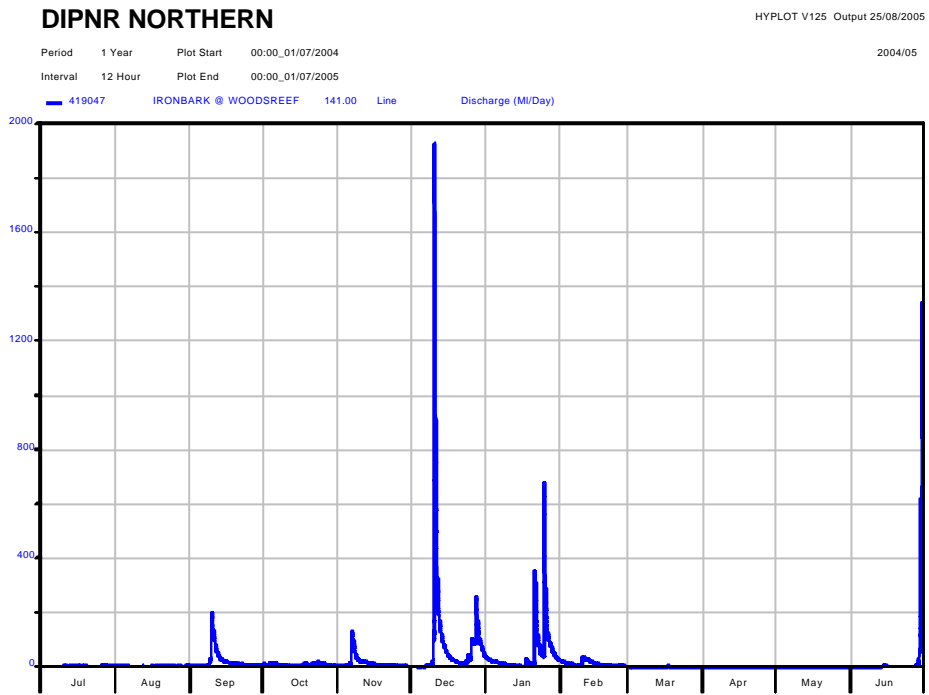


Figure 3.8 Manilla River flow at Black Spring (Figure supplied by DIPNR)

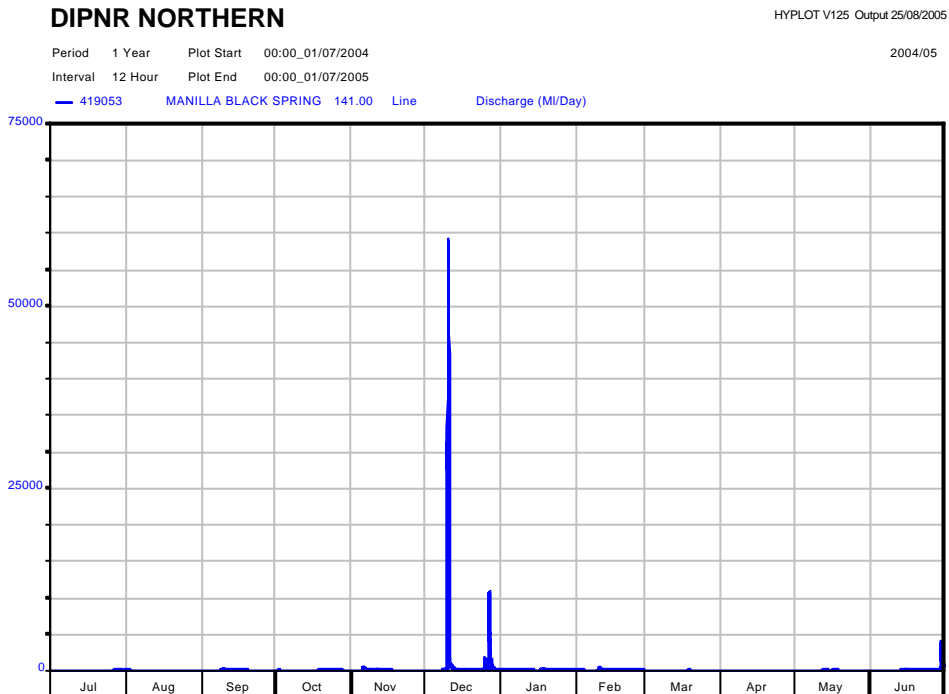


Figure 3.9 Manilla River at flow Brabri (Figure supplied by DIPNR)

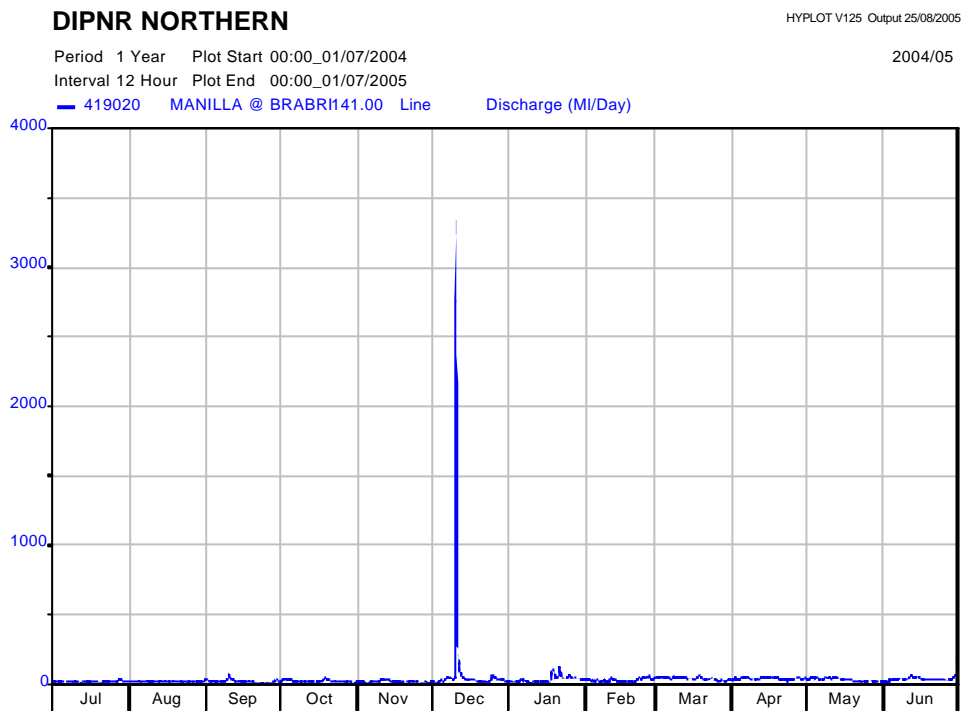
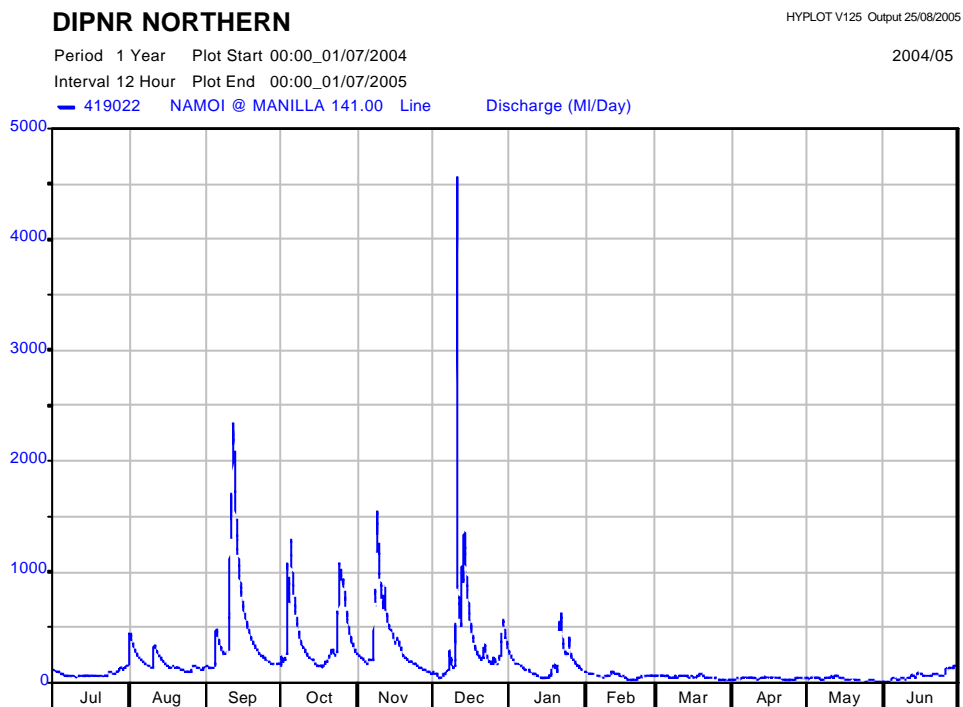


Figure 3.10 Namoi River flow at Manilla (Figure supplied by DIPNR)



3.3 RIVER HEALTH AND WATER QUALITY

Water monitoring has been carried out during the reporting period by the Department of Infrastructure, Planning and Natural Resources (DIPNR) now the Department of Natural Resources (DNR). The monitoring is carried out at a number of sites on the Peel, Cockburn, MacDonald, Manilla and Namoi Rivers as well as Goonoo Goonoo Creek. Data on pH, electrical conductivity (salinity) turbidity and nutrients is currently available and provides an ongoing insight into water quality in the Region. Results from the following sites are shown in the tables below. The sites are listed in Table 3.1 to follow the Peel and Namoi River Catchments and their tributaries downstream. There are gaps in the data for some months shown as not available (n/a) because agency staff may not be available due to other duties some months, equipment may be faulty or there may be no flow in the creek or river to test.

Table 3.1 Water Quality testing sites.

Number	Location
	Peel Catchment
Site 1.1	Peel River at Bowling Alley Point
Site 1.2	Peel River below Chaffey Dam
Site 1.3	Cockburn River at Mulla Crossing
Site 1.4	Peel River at Paradise
Site 1.5	Goonoo Goonoo Creek at Meadows Lane
Site 1.6	Peel River at Appleby Bridge
Site 1.7	Peel River at Carrol Gap
	Namoi River Catchment
Site 2.1	MacDonald River at Bendemeer
Site 2.2	Namoi River at Manilla Weir
Site 2.3	Manilla River at Glen Riddle (Woods Reef)
Site 2.4	Manilla River below Split Rock Dam
Site 2.5	Manilla River at Manilla Railway Bridge

3.4 pH

The acceptable pH level for freshwater ecosystems is between 6.5 and 9.0. All the readings during 2004-2005 were within acceptable levels.

Table 3.2 Monthly pH readings at various sites (Data supplied by DIPNR)

Location	July 2004	Aug 2004	Sept 2004	Oct 2004	Nov 2004	Dec 2004	Jan 2005	Feb 2005	Mar 2005	Apr 2005	May 2005	Jun 2005
Site 1.1	8.5	n/a	8.5	8.6	8.4	8.5	8.6	8.6	n/a	n/a	n/a	n/a
Site 1.2	8.4	n/a	8.4	8.6	8.6	8.2	8.3	8.5	n/a	n/a	n/a	n/a
Site 1.3	8.3	8.5	8.5	8.5	8.4	8.3	n/a	8.6	8.8	8.1	n/a	n/a
Site 1.4	8.3	8.1	8.2	7.9	8.0	8.1	8.0	8.5	8.3	8.2	8.4	8.3
Site 1.5	8.3	8.5	8.5	8.4	7.8	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Site 1.6	8.5	8.3	8.2	8.2	8.5	8.2	n/a	8.6	8.0	8.4	7.9	8.5
Site 1.7	8.5	8.5	8.3	8.3	8.5	8.4	n/a	8.6	8.3	8.4	8.2	8.4
Site 2.1	7.9	7.9	7.9	7.9	8.0	7.9	n/a	8.2	7.6	7.5	7.4	8.0
Site 2.2	8.3	8.1	8.0	7.8	8.1	7.9	n/a	8.4	8.0	8.2	8.0	8.4
Site 2.3	8.4	8.6	8.3	n/a	8.4	8.7	8.3	8.6	8.3	n/a	n/a	8.3
Site 2.4	8.3	8.3	8.4	n/a	8.3	8.4	8.3	8.4	8.1	8.1	n/a	8.2
Site 2.5	8.4	8.1	8.0	7.9	8.2	7.9	n/a	8.6	8.3	8.4	8.0	8.4

3.5 ELECTRICAL CONDUCTIVITY (SALINITY)

Electrical conductivity is a measure of salinity measured in deci-cemens per cm (uS/cm) at 25 C. The target at the bottom of the Namoi catchment is 550 uS/cm.

Table 3.3 Monthly E. C. readings at various sites (Data supplied by IPNR)

Location	July 2004	Aug 2004	Sept 2004	Oct 2004	Nov 2004	Dec 2004	Jan 2005	Feb 2005	Mar 2005	Apr 2005	May 2005	Jun 2005
Site 1.1	420	n/a	361	329	289	334	364	309	n/a	n/a	n/a	n/a
Site 1.2	346	n/a	349	350	351	346	350	351	n/a	n/a	n/a	n/a
Site 1.3	394	379	379	250	327	358	293	385	374	447	n/a	n/a
Site 1.4	544	449	404	294	439	385	419	428	399	416	410	444
Site 1.5	1150	1130	1140	809	1170	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Site 1.6	834	619	487	402	629	573	601	755	751	707	653	709
Site 1.7	882	690	512	439	687	864	657	976	1110	1080	1070	909
Site 2.1	127	120	123	113	118	146	111	134	144	148	154	160
Site 2.2	293	172	171	164	181	223	183	278	466	594	683	802
Site 2.3	933	863	893	n/a	452	624	416	505	715	n/a	n/a	879
Site 2.4	358	344	357	n/a	366	365	356	342	338	817	n/a	364
Site 2.5	366	187	162	166	193	247	219	373	458	464	462	560

3.6 TURBIDITY

Turbidity levels relate to the clarity of the water and are measured in NTU.

Table 3.4 Monthly turbidity readings at various sites (Data supplied by DIPNR)

Location	July 2004	Aug 2004	Sept 2004	Oct 2004	Nov 2004	Dec 2004	Jan 2005	Feb 2005	Mar 2005	Apr 2005	May 2005	Jun 2005
Site 1.1	14	n/a	1.9	12	8	7	4	3	n/a	n/a	n/a	n/a
Site 1.2	9.2	n/a	5.4	5.3	7.1	3	4	3	n/a	n/a	n/a	n/a
Site 1.3	1.2	5.8	3.4	6.8	2.1	4.9	4	3	n/a	n/a	n/a	n/a
Site 1.4	9.3	15	15	16	7.9	17	16	10	n/a	7	n/a	n/a
Site 1.5	1.6	4.4	2.3	15	14	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Site 1.6	22	37	38	36	30	50	29	26	n/a	15	n/a	n/a
Site 1.7	32	37	45	33	37	50	55	31	n/a	18	n/a	n/a
Site 2.1	4.2	9.7	10	9.1	6.2	5.4	4	3	n/a	4	n/a	n/a
Site 2.2	7.2	14	14	25	19	330	12	9	n/a	7	n/a	n/a
Site 2.3	1.1	1.2	0.9	1.9	70	4.2	3	3	3	5	n/a	1
Site 2.4	2.6	3.6	5.1	3.6	3.8	3.9	10	10	8	7	2	2
Site 2.5	5.1	14	16	25	17	400	16	8	n/a	6	n/a	n/a

3.7 NUTRIENTS

Nutrients such as Phosphorus and Nitrogen (measured in mg/L) influence the growth of algae, including the toxic blue green algae.

Table 3.5 Monthly Nitrogen readings at various sites (Data supplied by DIPNR)

Location	July 2004	Aug 2004	Sept 2004	Oct 2004	Nov 2004	Dec 2004	Jan 2005	Feb 2005	Mar 2005	Apr 2005	May 2005	Jun 2005
Site 1.1	1.5	n/a	0.23	0.35	0.34	0.3	0.16	0.06	n/a	n/a	n/a	n/a
Site 1.2	0.78	n/a	0.61	0.55	0.64	0.48	0.43	0.34	n/a	n/a	n/a	n/a
Site 1.3	0.15	0.34	0.3	0.41	0.33	0.42	1.4	0.29	1.2	1.3	n/a	n/a
Site 1.4	0.29	0.51	0.41	0.49	0.25	0.31	0.26	0.17	0.3	0.1	0.2	n/a
Site 1.5	0.14	0.28	0.21	0.33	0.31	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Site 1.6	3.6	2.2	1.6	1.4	1.9	2.2	1.5	0.61	0.9	0.49	0.98	n/a
Site 1.7	1.1	2	1.1	0.96	0.6	0.64	0.46	0.34	0.38	0.29	0.31	n/a
Site 2.1	0.27	0.4	0.52	0.57	0.61	0.62	0.65	0.51	0.47	0.3	0.36	n/a
Site 2.2	0.31	0.4	0.55	0.86	0.63	0.89	0.72	0.51	0.59	0.45	0.35	n/a
Site 2.3	0.06	0.2	0.16	0.16	0.2	0.47	0.22	0.27	0.17	0.33	0.13	n/a
Site 2.4	0.63	0.66	0.65	0.59	0.72	0.72	0.66	0.6	0.52	n/a	0.56	0.55
Site 2.5	0.35	0.42	0.6	0.82	0.65	0.85	0.64	0.39	0.41	0.21	0.29	n/a

Table 3.6 Monthly Phosphorus readings at various sites (Data supplied by DIPNR)

Location	July 2004	Aug 2004	Sept 2004	Oct 2004	Nov 2004	Dec 2004	Jan 2005	Feb 2005	Mar 2005	Apr 2005	May 2005	Jun 2005
Site 1.1	0.1	n/a	0.03	0.07	0.07	0.08	0.07	0.06	n/a	n/a	n/a	n/a
Site 1.2	0.05	n/a	0.03	0.03	0.05	0.05	0.05	0.05	n/a	n/a	n/a	n/a
Site 1.3	0.01	0.02	0.01	0.02	0.02	0.04	0.04	0.04	0.08	0.12	n/a	n/a
Site 1.4	0.03	0.04	0.03	0.03	0.04	0.06	0.04	0.04	0.04	0.03	0.03	n/a
Site 1.5	0.07	0.09	0.08	0.09	0.1	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Site 1.6	0.27	0.15	0.11	0.11	0.16	0.24	0.15	0.18	0.19	0.11	0.1	n/a
Site 1.7	0.17	0.16	0.12	0.11	0.14	0.17	0.13	0.11	0.09	0.08	0.06	n/a
Site 2.1	0.03	0.04	0.04	0.04	0.06	0.08	0.07	0.73	0.40	0.03	0.03	n/a
Site 2.2	0.03	0.04	0.05	0.06	0.06	0.21	0.08	0.06	0.07	0.06	0.04	n/a
Site 2.3	0.06	0.04	0.03	0.03	0.03	0.06	0.05	0.05	0.05	0.06	n/a	0.02
Site 2.4	0.03	0.02	0.03	0.02	0.02	0.02	0.05	0.07	0.1	0.05	0.02	n/a
Site 2.5	0.02	0.04	0.05	0.06	0.06	0.2	0.05	0.05	0.04	0.02	0.02	n/a

Table 3.7 Monthly Nitrogen and Phosphorus ratio readings at various sites (Data supplied by DIPNR) The ratio of Nitrogen to Phosphorus is considered an important indicator with low ratios favouring algal blooms. Ratios remained around or above seven indicating a medium risk for algal blooms.

Location	July 2004	Aug 2004	Sept 2004	Oct 2004	Nov 2004	Dec 2004	Jan 2005	Feb 2005	Mar 2005	Apr 2005	May 2005	Jun 2005
Site 1.1	15.6	n/a	7.9	5.3	4.6	3.8	2.5	0.9	n/a	n/a	n/a	n/a
Site 1.2	15.2	n/a	20.3	19.0	13.1	9.6	9.4	6.6	n/a	n/a	n/a	n/a
Site 1.3	16.7	n/a	20.0	23.0	24.1	14.3	9.8	33.9	6.7	15.2	10.7	n/a
Site 1.4	11.2	14.2	13.2	15.3	6.0	5.6	6.1	4.0	8.0	3.4	7.8	n/a
Site 1.5	2.0	3.1	2.7	3.9	3.3	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Site 1.6	13.2	15.1	14.3	12.5	11.8	9.1	10.1	3.4	4.9	4.6	9.8	n/a
Site 1.7	6.6	12.3	9.2	8.7	4.3	3.8	3.6	3.1	4.4	3.9	5.2	n/a
Site 2.1	10.8	9.1	12.7	13.3	10.5	8.3	9.5	7.0	11.1	9.6	13.8	n/a
Site 2.2	11.1	11.4	11.5	14.8	11.3	4.2	9.3	9.0	8.6	7.6	9.2	n/a
Site 2.3	4.8	3.3	5.9	8.0	8.2	4.2	5.5	3.3	7.2	2.4	n/a	n/a
Site 2.4	24	30	24	39	36	36	12	8.5	5.2	n/a	11.1	24.1
Site 2.5	17.5	11.1	11.3	14.3	11.4	5.0	11.8	7.5	9.6	9.2	12.8	n/a

3.8 WATER SUPPLY SCHEMES

Tamworth Regional Council operates the following seven water supply schemes

- 1 Attunga,
- 2 Barraba,
- 3 Bendemeer,
- 4 Kootingal / Moonbi,
- 5 Manilla,
- 6 Nundle and
- 7 Tamworth.

Since the amalgamation TRC has operated one water supply fund and subject to funding availability, is focused on providing reliable water supplies to communities in the Council area.

3.8.1 Attunga Water Supply

Attunga has slightly hard water from a groundwater source on the Peel River. The water supply also supplements the limestone mine during drought periods. In the longer term, Council may extend treated water out from Tamworth.

3.8.2 Barraba Water Supply

Barraba draws its water supply from three sources, Connors Creek Dam, Manilla River and Barraba Creek. Council is endeavouring to obtain government funding to augment the Barraba water supply reliability and quality. At times, Barraba can become desperately short of water and under the present arrangements, would not attract new developments requiring a secure water supply.

Council's preferred option is to run a pipeline from Split Rock Dam to Barraba, and if this option were to proceed it would provide a reliable source of raw water along the pipeline route from Split Rock Dam to Barraba (potential source of water for industry such as poultry). DIPNR have discussed this with Council. The water treatment plant is at Barraba so the pipeline would be a raw water source only.

3.8.3 Bendemeer Water Supply

Council is in the process of evaluating tenders for a treatment plant to treat the raw water supply at Bendemeer and will proceed with the augmentation subject to grant funding. A treated water supply will improve amenity within the village, however reliability of supply from the McDonald River will continue to be a problem during drought periods. At this point in time, Council has no definite plans to provide an off stream storage for drought security for Bendemeer.

3.8.4 Manilla Water Supply

Located below Split Rock Dam, Manilla has a secure supply of water however the infrastructure in place at present limits the amount of water that can be pumped across from the Manilla River during drought periods. This limitation will be eliminated in time and not considered a constraint on development.

From a planning perspective, the treated water reservoirs in Manilla are relatively low and some areas experience low pressure (eg Namoi River Road). This needs to be taken into consideration with zoning of land (augmentation may be required).

3.8.5 Nundle Water Supply

Nundle water supply comes from the Peel River and bore water with the capacity to cater for future growth.

3.8.6 Tamworth Water Supply (including Kootingal Moonbi)

The Kootingal/Moonbi water supply is connected to the Tamworth water supply system at Nemingha to supplement the supply during drought periods (Kootingal bores drop during drought periods). Over the next few years, Council proposes to upgrade the water supply to Nemingha which will provide a more secure supply to the Nemingha/Kootingal/Moonbi area.

Prior to the Council amalgamations, the Tamworth water supply did not extend beyond the former Tamworth City Council boundary with the exception of the Kootingal/Moonbi supply and connections to some commercial enterprises such as Baiada poultry farms and Tangaratta Feed Mill.

Since the Council amalgamations, Council has allowed the extension of the Tamworth water supply beyond the current serviced area subject to the developer paying the full cost of the extension in accordance with Council policy "Reimbursement of Developers for Sewer and Water Supply Infrastructure" (allows developer to be reimbursed for third party connections over the ensuing 20 years).

Tamworth's raw water is sourced from Council's Dungowan Dam via the Dungowan Pipeline and the State owned Chaffey Dam (released from dam and drawn out of Peel River at Tamworth). Council relies on Chaffey Dam for long term security of Tamworth water supply (High Security water). During drought periods, General Security users (irrigators and other non High Security users) only receive small allocations (nil in some years). This low reliability for General Security use has generally prevented investment in industries such as poultry farms, dairies, intensive irrigation etc. At present, State Water is investigating safety upgrade options for Chaffey Dam (Probable Maximum Flood) and is also examining options of increasing the dam capacity from the present 62GL capacity. Increasing the dam capacity would boost socio economic development of the Peel valley. The preferred upgrade option should be known within 12 months.

At present, the most reliable General Security water in TRC area is the stretch of Manilla River/Namoi River between Split Rock Dam and Keepit Dam (this is very reliable General Security water compared to most other valleys in NSW) and would be an ideal area for industries/intensive agriculture to source water (assuming they can purchase a water licence).

3.8.7 Other Villages (currently no water supply)

Duri does not have a water supply system. In the longer term Council may extend Tamworth water supply to Duri.

3.9 DAM WATER SUPPLY LEVELS

The major water supply dams in the region are Chaffey, Keepit, Split Rock and the much smaller Dungowan Dam. All are owned and managed by State Water except for Dungowan Dam which is owned and managed by Tamworth Regional Council. Council also contributed significantly to the cost of building Chaffey Dam because it is the major source of water for the City of Tamworth with a supplementary supply coming from the much smaller Dungowan Dam.

The capacity and levels of Dungowan and Chaffey Dam are shown in Table 3.8. The monthly storage levels as a percentage of capacity for Chaffey, Keepit and Split Rock Dams are shown in Figure 3.11 with Dungowan Dam shown in Figure 3.12. Despite the good

rainfall and streamflows reported earlier all of the dams , except Split Rock which was consistently low, finished the year significantly (between 10-20%) lower than at the beginning of July 2004.

Table 3.8 Dungowan and Chaffey Dam capacities and levels

Dam	Capacity (ML)	Level at 30/6/02	Level at 30/6/03	Level at 30/6/04	Level at 30/6/05
Dungowan	6 30	53.5%	46%	82%	60%
Chaffey	62 000	78.9%	31.0%	46.5%	41%

Figure 3.11 Chaffey, Keepit and Split Rock levels 2004-2005

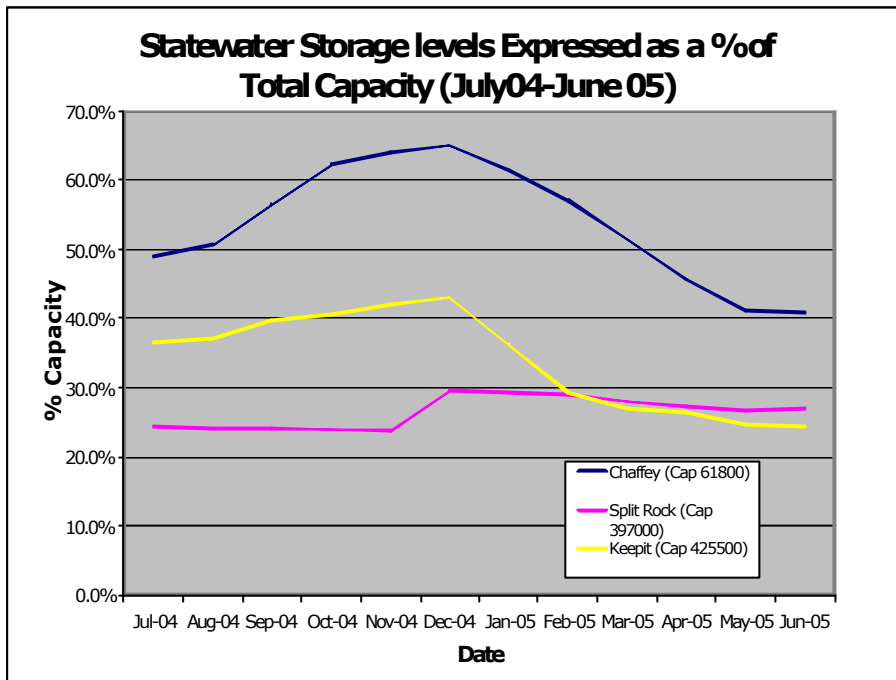
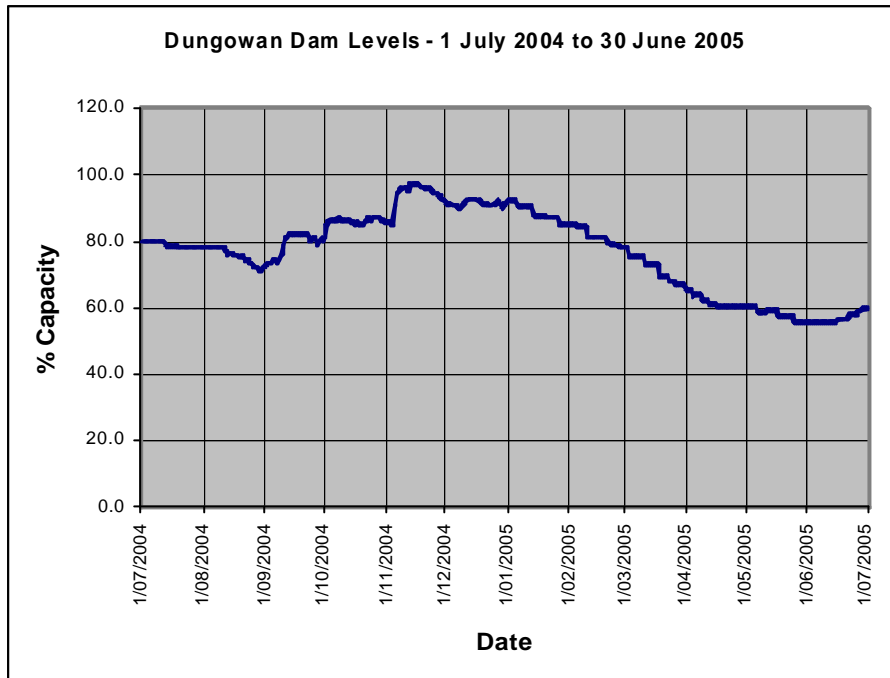


Figure 3.12 Dungowan Dam levels 2004-2005



3.10 DAM UPGRADES

The NSW Government is currently examining options to increase the capacity of both Chaffey and Keepit Dams. Several years ago the Dam Safety Committee undertook a risk assessment of all state owned dams in NSW. Chaffey Dam was ranked the second highest risk after Keepit Dam because they do not meet modern dam safety requirements for large to extreme flood and earthquake events. The State Government has commenced a program to improve the safety of both dams.

The Chaffey Dam Upgrade Community Reference Panel (CRP) was established to ensure that the residents of the Peel Valley would be effectively involved in the project. State Water relies on the panel, which has three Council representatives, to provide key advice on how to approach the community to gather input and receive feedback on the project.

Works to date have included placing a 1.8 metre high, precast concrete parapet wall on top of the existing wall to increase the height and therefore the capacity of the dam which will assist in controlling flood waters. Investigations and research are currently being undertaken to improve the dam to meet safety standards and satisfy future water needs of the region.

State Water is developing a series of options including spillway capacity, water quality, water supply reliability and increased capacity. The CRP is continually assessing the effect of each of the proposed options on heritage sites, the arboretum, recreational facilities, the farming community and downstream flood protection.

A similar consultative process is underway with the proposed Keepit Dam upgrade with a different range of options and potential effects on the community of the Namoi Valley particularly in Gunnedah Shire.

3.11 WASTEWATER (SEWERAGE) SCHEMES

TRC operates four wastewater schemes at ;

- 1 Barraba,
- 2 Kootingal,
- 3 Manilla, and
- 4 Tamworth.

Since the recent local government amalgamations TRC has operated one wastewater supply fund and subject to funding availability is focused on providing wastewater schemes to communities in the Council area.

3.11.1 *Barraba, Manilla and Kootingal*

These three towns have wastewater systems to cater mainly for residential and light commercial industries. Any major industries wishing to connect to the wastewater system would have to be assessed to determine the impacts on the treatment processes.

3.11.2 *Tamworth*

Tamworth is home to significant food processing industries and TRC currently accepts and treats trade waste from most industries.

Council is keen to foster further development and proposes to augment the Tamworth wastewater system to cater for further residential and industrial development.

Since the Council amalgamations, TRC has allowed the extension of the Tamworth wastewater system beyond the current serviced area subject to the developer paying the full cost of the extension in accordance with Council policy "Reimbursement of Developers for Sewer and Water Supply Infrastructure" (allows developer to be reimbursed for third party connections over the ensuing 20 years). At present, the wastewater collection system is being extended to accept discharge from the Hills Plains East area.

Council has adopted a policy for installation of low pressure sewer systems which will become more commonly used in lower density fringe areas or areas difficult to service with gravity sewer.

3.11.3 *Other Villages (Currently no Wastewater System)*

Nundle, Duri, Attunga, Moonbi and Bendemeer do not have wastewater systems. In the longer term Council may install wastewater systems, however there is nothing definite at this point in time (to be investigated).

Figure 3.13 Chaffey Dam showing spillway and rock wall



PRESSURE – the driving forces

3.12 DEMAND FOR WATER

The table below shows the number of residential water connections throughout the Council area. There are some variations in the quality of the data as a result of the amalgamation process.

Table 3.9 Number of residential connections serviced by each town water supply system at the end of June 2004 and end of June 2005.

Residential Water Supply Connections		
Town/Village	Residential 2003-2004	Residential 2004-2005
Kootingal/Moonbi	757	771
Attunga	139	135
Barraba	724	613
Manilla	914	959
Bendemeer	109	118
Nundle	212	168
Tamworth	13,130	13,299
TOTAL	15985	16063

3.13 WATER CONSUMPTION

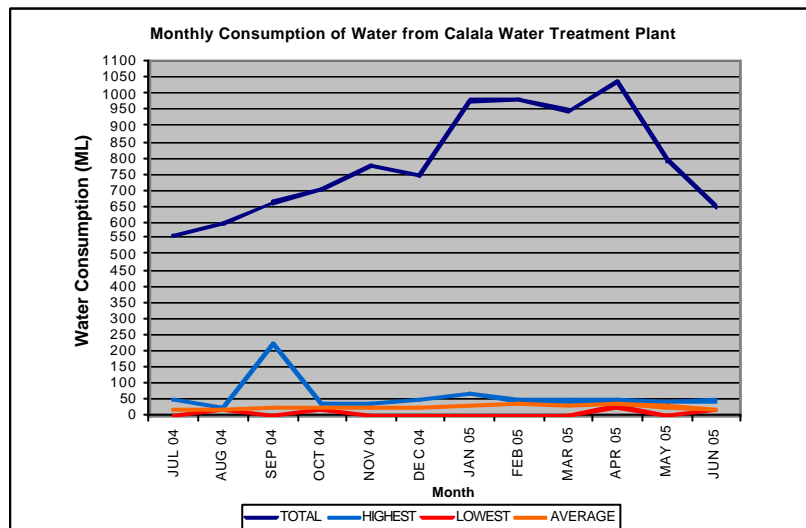
The water consumption in the towns and villages supplied by Council during 2004-2005 is shown in Table 3.10.

Table 3.10 Towns and village annual water consumption

Water Consumption for the Towns/Villages (ML) 04/05								
Town/Village	Residential	Commercial	Industrial	Rural	Institutional	Bulk water	Public parks	TOTAL
Kootingal/Moonbi	226	8.2	0	20	0	0	0.2	254
Attunga	33.5	21.5	0	0.5	0	0	0	55.5
Barraba	115	18	0	6	0	0	0	139
Manilla	245	18	0	10	0	0	0	136
Bendemeer	17.4	3	0	1.3	0	0	8	29.7
Nundle	66	31	0	29	0	0	0	126
Tamworth	4,921	973	1534	77	349	10	483	8347

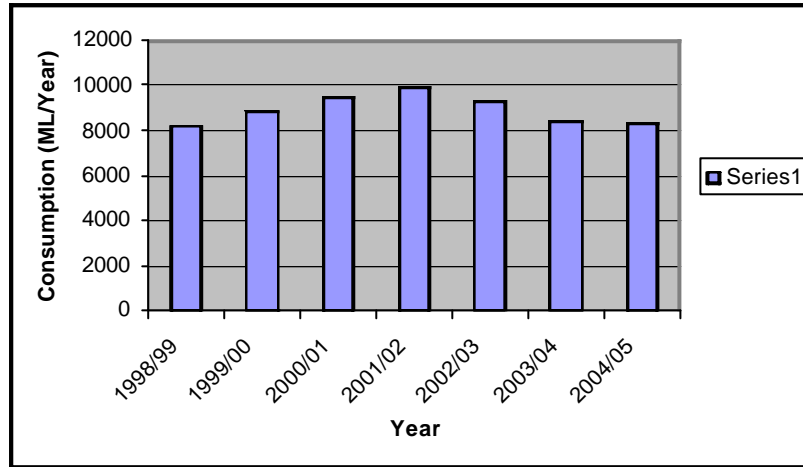
The highest, lowest and average monthly water consumption from the Calala Water Treatment plant are shown in Figure 3.13.

Figure 3.14 Highest lowest and average monthly water consumption from Calala Water Treatment Plant



The total water consumption in Tamworth for 2004-2005, being the total amount of water distributed from the Calala water treatment plant, was 8347 megalitres. This is 118 megalitres less than the previous year, 2003-2004, which was 8465 megalitres as shown in Figure 3.14. Heavy rainfall in January as well as continuing water restrictions and community awareness campaigns have all contributed to the decrease in total water consumption.

Figure 3.15 Total volume of water distributed per year from the Calala Water Treatment Plant



RESPONSE the policies, plans and actions

3.14 INTEGRATED WATER CYCLE MANAGEMENT

There are many Commonwealth and State Government policies, programs and projects aim at saving water or making better use of it. Integrated Water Cycle Management (IWCM) is a new program from the Department of Energy, Utilities and Sustainability to assist local government to better manage urban water systems. The program aims to get the most out of water supply and water use at two levels-

- ♦ The community – by combining the management of water, sewerage and stormwater, and
- ♦ The environment – by minimising the impacts on the catchment which provides urban water and receives discharges.

Integrating the whole water cycle means the following benefits for the community and the environment –

- ♦ A more efficient water service,
- ♦ Correct pricing that reflects scarcity,
- ♦ Versatility of service provision,
- ♦ Greater sustainability of supply,
- ♦ Sign-off from key stakeholders,
- ♦ The Utility (Council) can declare a water dividend,
- ♦ A more equitable distribution of water across all users,
- ♦ Minimised environmental impacts,
- ♦ Compliance with a pre-requisite for government funding and
- ♦ Legislative compliance

3.15 INTERIM STRATEGY FOR URBAN WATER EFFICIENCY

The Tamworth Regional Council is committed to proactive water conservation measures and initiatives particularly through water efficiency. The Interim Water Efficiency Strategy which was adopted by Council early in 2005 will in time encompass short term, medium term and long term goals. Whilst formulating a long term holistic strategic position, it is considered desirable to adopt an interim strategy to allow the Council to move ahead in the immediate future.

Tamworth Regional Council is committed to the principles of demand management. Demand Management is defined as the introduction of programs aimed to achieve the efficient use of water by the adoption of price and non price measures.

The range of measures proposed to be adopted include:

- ♦ Price control
- ♦ Raising community awareness
- ♦ Residential refit program
- ♦ Water loss management
- ♦ Water conservation management
- ♦ Outdoor watering
- ♦ Effluent reuse
- ♦ Stormwater harvesting

3.16 WATER RESTRICTIONS

Water restrictions continued throughout the year for all areas within the Council regional area. In May 2005, tighter rules were imposed in Bendemeer and Manilla where supplies were critical and hand-held hoses only were allowed.

In the areas of Attunga, Moonbi/Kootingal, Tamworth, Barraba and Nundle, sprinklers were allowed between 8am and 4pm each day. The restrictions were revised to enable the use of sprinklers during daylight hours over winter due to overnight frosts and the end of daylight savings rendering the use of sprinklers overnight unworkable. Reduced consumption and low evaporation rates over the cooler months also contributed to the decision to alter the times.

In July 2005, TRC revised the water restrictions for the Manilla and Bendemeer areas to allow residents to use sprinklers between 8am and 4pm on all days as a result of recent rainfall, recharged streams and rivers and increased storage levels.

3.17 WATER AND SEWAGE AUGMENTATIONS

The proposed upgrade of the water supply to Nemingha will provide a more secure supply to the Nemingha/Kootingal/Moonbi area. A proposed trunk water main augmentation will extend from Crawford Street to Nemingha pumping station and a survey of the route is currently in progress.

The existing Tamworth water supply system is being extended to Hills Plain via the Hills Plain reservoir. A new trunk water main has recently been laid to the corner of Forest Road and Brown's Lane from Reservoir Road.

The existing wastewater collection system is being extended to accept discharge from the Hills Plains East area and new pressure sewer mains are soon to be laid along Forest Road to service the new development connections.

3.18 SEWAGE TREATMENT UPGRADES

The proposed Tamworth Sewerage Augmentation and 100% Effluent Reuse Scheme has been significantly delayed. Delay during this reporting period was experienced due to the State Government's changes to the Country Towns Water Supply and Sewerage (CTWSS) Program.

In July 2004, Council received advice from the State Government that there would be changes in the level of subsidy available for sewer and water supply projects. In particular, that Councils with a turnover greater than \$10 million per annum (for water and sewer combined) would have the maximum rate of subsidy reduced from 50% to 20%. The Government also indicated that it was undertaking a ranking process of all projects awaiting funding, for the purposes of determining priority for funding. Following the conclusion of the ranking process, Council received confirmation in February 2005 that funding would be available for the Tamworth Sewerage Augmentation to proceed. However, Council is still awaiting advice on the level and amount of funding that will be available for the project.

Nutrient stripping facilities at both of the wastewater treatment plants in Tamworth worked well during the year resulting in a reduction of approximately 45 tonnes of Phosphorus being discharged from the treatment plants.

Further fencing work was undertaken within the Bolton's Creek Grassy box Woodland area adjacent to the site of the proposed Effluent Reuse Farm. The fencing work is partially funded from the Commonwealth Government's Envirofund and is part of a program for management of the woodland being undertaken by the Tamworth Beneficial Reuse Farm Community Consultation Committee.

3.19 KOOTINGAL SEWERAGE TREATMENT WORKS EFFLUENT IRRIGATED TREE PLANTATION

The Moonbi Community Landcare and Development Group held an Open Day late in 2004 to review progress on this project which uses treated effluent to irrigate a plantation of various tree species near the Kootingal Sewerage Treatment Works. The plantation converts nutrient laden grey water into living biomass and the growth rates of many species has surprised the volunteers who have developed and manage the area. During the year the group has mowed the area, replaced some trees and carried out weed control.

3.20 RIVERINE CORRIDOR MANAGEMENT

The Namoi Catchment Management Authority has recognised riverine ecosystems and groundwater as one of its four key program areas. Its draft management target for this program is

- ♦ by 2016, there will be an improvement in priority areas in riverine structural stability and the condition and extent of native riverine vegetation.

The intent is to improve and maintain the condition of high quality riverine environments in priority areas. This will be achieved by improved land management, revegetation and rehabilitation.

3.21 NAMOI RIVER STYLES REPORT

This report was funded by the Nation Action Plan for Salinity and Water Quality as an interim priority project from the Namoi Catchment Blueprint. River Styles provides a geomorphic summary of river character and behaviour primarily based on the relationship between channel and valley morphologies and the broader landscape. The analysis of the Namoi catchment assessed around 10,000 kilometres of rivers and streams.

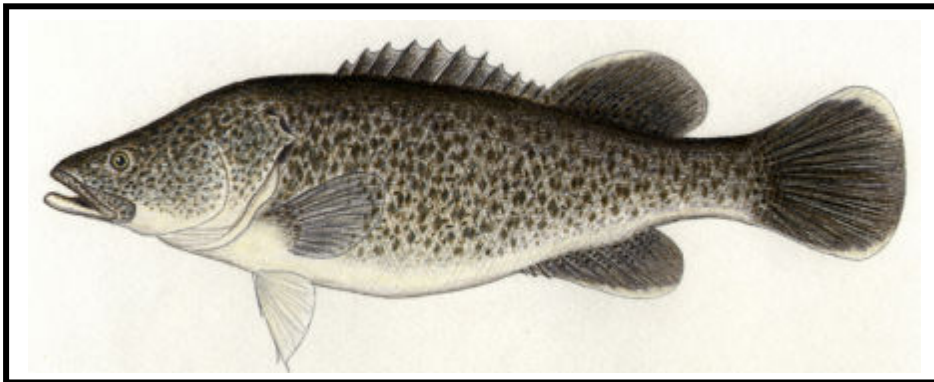
The report identified 23 different River styles in the catchment in four broad categories based on valley morphology namely-

- ◆ Confined,
- ◆ Partly confined,
- ◆ Laterally-unconfined and discontinuous.

A broad- brush assessment of geomorphic condition of the waterways found that 20% are in good, 50% are in moderate and 30% are in poor indicative conditions. The report goes on to determine that conservation and rehabilitation actions be targeted initially at certain specific stretches of streams and rivers. A number of these including the Cockburn tributaries are in the Tamworth Regional Council area.

Figure 3.16 Murray Cod

Photo by Jack Hannon NSW Fisheries



3.22 RIVERCARE, FISHERIES AND HABITAT

NSW Department of Primary Industry (Fisheries) is the agency with primary responsibility for conserving our fishery resources and has provided the following information.

3.22.1 Endangered Species

The River Snail *Notopala sublineata*.

3.22.2 Endangered Fish Populations

Western population of: Olive Perchlet *Ambassis agassizii*
Purple Spotted Gudgeon *Mogurnda adspersa*

3.22.3 Endangered Aquatic Ecological Communities

On 4 July 2003, the Endangered Aquatic Ecological Community of the Lowland Darling River was gazetted under the *Fisheries Management Act* 1994. This endangered ecological community includes the regulated Peel River below Chaffey Dam, the regulated sections of the Manilla and Namoi River below Split Rock Dam, and the Namoi River below Keepit Dam.

3.22.4 Vulnerable Fish Species

Silver Perch *Bidyanus bidyanus*

3.22.5 Key Threatening Processes

Key Threatening Processes listed under Schedule 6 of the *Fisheries Management Act* 1994 that have impacted, or continue to impact on waterways in Tamworth Regional Council area include:

- ◆ The introduction of fish to freshwaters within the river catchment outside their natural range.

- ♦ The removal of large wood debris.
- ♦ The degradation of native riparian vegetation along NSW water courses.
- ♦ Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams.
- ♦ Hook and line fishing in areas important for the survival of threatened fish species.

3.22.6 Significant Fish Habitats

Important fish habitats that occur in the Tamworth Regional Council area include: floodplain areas, riparian vegetation, instream aquatic vegetation, snags, gravel bars, over-hanging banks. The natural variability of flows that occur in rivers and creeks is very significant as, in addition to providing ecological triggers for a number of species, different flows make different habitats (such as floodplain during floods) available for fish.

3.22.7 Number of Fishways

Tamworth Regional Council LGA has one schauberger ramp/fishway on Goonoo Goonoo Creek, eight schauberger ramp/fishways on the Cockburn River, two partial width rock ramp fishways on the Namoi River at Manilla and one inoperable vertical slot fishway on the Manilla River at Barraba.

3.22.8 Number of Potential Road Crossing Barriers to Fish

The number of potential road crossing barriers to fish is unknown however DPI (Fisheries) are currently managing a project funded by the Namoi Catchment Management Authority entitled "The Assessment and Modification of Barriers to Fish Passage in the Namoi Catchment". This project is anticipated to be completed in early 2006 and will form the basis of prioritising barriers for remediation.

3.22.9 Permits Issued Under Part 7 of the Fisheries Management Act 1994

Tamworth Regional Council LGA has had 7 permits issued by the Department of Primary Industry (Fisheries) under section 200 of the *Fisheries Management Act 1994* (Dredging and reclamation) during 2004-2005, and one existing permit extended.

3.22.10 Compliance Under Part 7 of the Fisheries Management Act 1994

There have been 2 separate breaches within the Tamworth Regional LGA under Part 7 of the *Fisheries Management Act 1994* in 2004-2005.

3.22.11 Alien or introduced Species

- ♦ Carp *Cyprinus carpio*
- ♦ Gambusia *Gambusia holbrooki*
- ♦ Goldfish *Carassius auratus*
- ♦ Rainbow Trout *Oncorhynchus mykiss*

3.23 Fisheries Habitat Grant

This project was planned in cooperation with NSW Fisheries (now Department of Primary Industries), the Department of Planning, Infrastructure and Natural Resources (now Department of Natural Resources) and local fishing clubs. Approximately five kilometres of the Peel River between Paradise Caravan Park and Jewry Street in Tamworth were surveyed for suitable sites for fish habitat improvements. Ten sites

were identified as requiring removal of willows, weed control, minor contouring and placement of snags to improve habitat value.

Sites were prioritized and budgets prepared. Details of works required at each site were documented and a funding application prepared. Grant funds of around \$8,000 were obtained from NSW Fisheries and the Inland Recreational Fishing Trusts to be matched by Council.

The highest priority site was commenced in early 2004 with work including removal of all branches above water level and all except the bases of mature willow trees which were poisoned. A snag was realigned and 500 long stemmed native tubestock were purchased from State Forests nursery at Gunnedah for planting at the end of winter.

Two "Fish Habitat in the Peel" signs were designed by Council and Fisheries for erection at either end of the project. See Figure 3.16. The project was publicised in the Northern Daily Leader newspaper and on local radio. Council will be applying for additional funding for further stages of the project in 2005.

Figure 3.17 Fish habitat sign erected beside Peel River in Tamworth.

FISH HABITAT IN THE PEEL

The Peel River is 266 km long and extends from Nundle to the Namoi River below Keepit Dam. It is home to our native Murray Cod, Golden Perch, Silver Perch and Eel Tailed Catfish.

Tamworth Regional Council and the Freshwater Recreational Fishing Trust are actively restoring this part of the Peel River.

Restoration of fish habitat in the Peel River is about restoring native trees and shrubs along the riverbank. These plants offer shade over the water and provide a source of food for fish from falling insects. Even fallen leaves are a food source for aquatic bugs on which fish feed. Willows and other introduced plants do not support these sources of food for fish – sometimes they can be harmful to aquatic life.

Fish habitat restoration projects involve replacing trees like willows with native species.



Illustration courtesy Jack Hannon NSW Fisheries

Murray Cod – *Maccullochella peelii*

Australia's biggest freshwater fish. It grows to a length of 1.8m and over 100kg in weight

Tamworth
Regional
Council

Your
fishing
licence
at work
Recreational
Fishing Trusts

3.24 WATER WEEK

As part of Water Week 2004, (17th – 23rd October), a Council promotion to save water offered the first 300 residents within TRC area on potable water to bring their old showerhead to their local council office and exchange it for a new water-saving AAA type showerhead. There were 226 showerheads exchanged as part of this initiative.

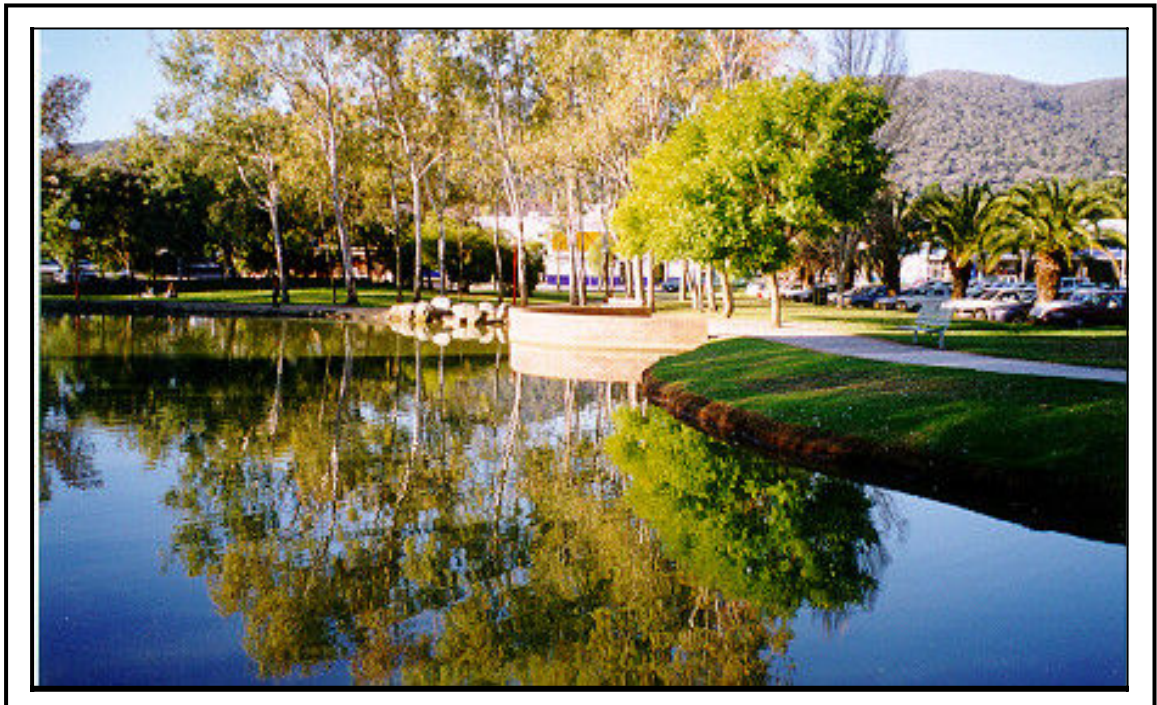
The new showerheads use 9 litres of water per minute, compared to 22 L/min for older models.

3.25 WATER WISE

The average home in Australia uses 230,000 litres of water per year. 27% of this water is used in the bathroom and shower. Without dual flush up to 15% of water can be flushed down the toilet and 20% can be used in the laundry. A single dripping tap can waste more than an average household uses in a month or more than 24,000 litres. Hosing the garden or washing the car with a running hose for ten minutes can use about 200 litres of water and a sprinkler on the lawn for hours achieves little because of evaporation during the day. Overall more than 25% of household water use is outside.

Water saving tips for householders can be found in Appendix 1.

Figure 3.18 Bicentennial Park, Tamworth



4.0 AIR

4.1 AIR - INTRODUCTION

The air we breathe is composed of various gases including Nitrogen (78%), Oxygen (<21%), Argon (<1%) and Carbon Dioxide (<0.05%). Air is an odourless, tasteless invisible mixture of gases that surrounds the earth and forms its lower atmosphere. The atmosphere envelops the earth and extends from the surface gradually thinning as it extends into interplanetary space. The lowest layer of the atmosphere is called the troposphere. It extends to a height of approximately 11 kilometres and comprises the mixture of gases we know as air. The composition of the higher layers of the atmosphere is different to that of air.

Air supports life on this planet in two ways. It supplies oxygen to all living things and provides the ability for the combustion of fuels for a variety of human needs. Nitrogen from the air is incorporated into the growth of plants either directly or indirectly. Carbon Dioxide is taken up by photosynthesising plants, which in turn manufacture carbohydrates.

In terms of the global issue of climate change caused by emissions of carbon dioxide and other greenhouse gases into the atmosphere, the Tamworth region is probably typical of Australia overall. Australia has been calculated to be the highest per capita emitter of greenhouse gases in the world.

The Department of Environment and Conservation – Environmental Protection Agency's (EPA) survey *Who Cares about the Environment in 2003* shows that air quality, along with water issues, continue to be the two most important environmental issues in NSW. Many human activities impact upon our air, affecting its overall quality. Increases in population put increasing demand on industry, more cars are driven and more electricity consumed.

Due to our industrialised society, such demands result in many gases being produced to bring us the life we are accustomed to. These gases and other particles are released into the atmosphere and contribute to issues such as the greenhouse effect, global warming and can increase the incidence of respiratory problems such as asthma.

The atmosphere can be considered in three spatial sections. Global air masses circulate the world carrying with them the total effects of man made and natural pollutants (eg volcanic ashes and gases). Issues relating to the global air mass include the "enhanced greenhouse" effect and the depletion of the ozone layer in the stratosphere.

Regional air masses are defined by particular geographic boundaries. The quality of air within any particular region is related to the air shed where pollutants are emitted and the dispersal effects of various air movements. Regional air qualities become noticeable when large quantities of pollutants, such as those generated by vehicles or industry are associated with high population densities. These factors are amplified by unusual climatic (eg inversion layers) or geographic (eg narrow valleys, high natural barriers) features.

Local air masses relate to small areas of influence. The local air quality can differ between external and internal environments. In some instances, air quality within building compartments is much less acceptable than external air qualities. Australia with its largely open, flat terrain generally allows for effective mixing of air to occur.

Air and atmospheric quality are considered in this chapter in terms of global climate change and regional air quality issues.

STATE – the issues

4.2 CLIMATE CHANGE

Ozone is present in both the lower and upper atmospheres. In the upper atmosphere (more than 10km above the Earth) ozone plays an essential role in protecting plant and animal life from the harmful effects of ultraviolet radiation.

The NSW State of the Environment Report presents information on the depletion of ozone over Australia, and its potential health implications. Scientists have calculated that ozone depletion resulted in a 5-10% increase in UV-B radiation in Sydney between 1990 and 2000.

Climate change is the other major problem at the global level. The presence of greenhouse gases in the atmosphere has an insulating effect which leads to warming of the Earth's surface. Greenhouse gases such as carbon dioxide, methane and nitrous oxides trap part of the heat being radiated from the Earth back into space. While the 'greenhouse effect' occurs naturally and is essential for sustaining life on Earth, the majority of scientists now generally agree that the accumulation in the atmosphere of increased amounts of greenhouse gases produced by human activities (particularly by burning fossil fuels) is intensifying global warming.

4.3 NEW SOUTH WALES' AIR QUALITY

We have reached a critical point for air quality in NSW. The good news is that the air we breathe is substantially cleaner than it was 15 years ago, mostly through controls on industry, on motor vehicles and the fuels they use, and on backyard burning. But there is another side to the story.

As the population of NSW grows, the number of cars and trucks on the road also increases. The number of trips we take and the length of those trips are rising too, as we use our vehicles more intensively than ever before. This seemingly unstoppable growth of vehicle use not only congests our roads but it is also the most significant source of many of the pollutants that damage our air quality.

In the past, air quality management in NSW has focused mostly on the technological side of the equation by making vehicles and industrial technology cleaner. We will certainly need to continue to make gains through cleaner technology and cleaner production. But to protect our air quality well into the future, we must also approach the problem from another side of the equation and address how we use our motor vehicles.

Changing behaviour can often be harder than changing technology. The whole community will need to make positive choices about improving air quality to protect both our health and our economy.

4.4 TAMWORTH REGION'S AIR QUALITY

Air quality in Tamworth is generally described as good. Apart from short term air quality problems such as smoke from bushfires, or localised smoke from wood fires, or odours from various sources, Tamworth residents don't have to deal with serious regional air quality issues. This is evidenced by the lack of complaints in relation to the issue and general visible clarity of our airshed. However, no data has been available to demonstrate that this is correct.

Many of the activities that are intrinsic to our way of life release pollutants into the atmosphere. Widespread pollutants in urban areas are carbon monoxide, particulates, hydrocarbons, nitrogen oxides, sulphur dioxide and lead. These six substances in high concentration in urbanised areas, interact to form secondary pollutants collectively known as smog. Research is beginning to show close correlation between air pollution, and respiratory distress, as well as disorders such as asthma.

Air pollution can be significant, long term and widespread or more locally confined, short term and of nuisance value only. Odour, smoke and dust generating activities commonly trigger localised complaints to Council and / or the EPA about air quality, which can be significant for those concerned.

Poor indoor air quality can be the result of poor ventilation in buildings, the use of synthetic building materials and fabrics and the use of personal care products like perfume and hair spray. Problems are also caused by a host of everyday pollutants such as mould, dust mites, carbon monoxide, oxides of nitrogens, formaldehyde from flooring, cleaning agents, fibres, pesticides, off gases and carpet glues. More serious indoor air pollution can be caused by asbestos, radon or lead particles.

Since we are estimated to spend as much as 75% of our time in homes, offices and other buildings, the health risks associated with bad indoor air may be greater than outdoor air. As many as 50 to 100 Volatile Organic Compounds may be present in typical buildings. They include aliphatic and aromatic hydrocarbons, chlorinated hydrocarbons and various ketones and aldehydes.

Formaldehyde is an important industrial chemical used to produce many synthetic resins. These resins are applied as adhesives in the manufacturing of particleboard, paper products and some foams. Formaldehyde irritates the eyes, nose, throat and lungs. It can aggravate asthma and it might be a weak carcinogen.

Figure 4.1 Tamworth from Oxley Lookout



Oxides of nitrogen (NO_x) usually resulting from combustion processes such as gas cooking or heating, may be also be found in raised concentrations indoors. Nitrogen dioxide, NO₂ is associated with aggravation of asthma, particularly in children.

Pollen, bacteria, fungal, plant spores and viruses are all associated with airborne particles, and indoor air is suspected as a potential agent transmitting infectious disease.

Plants in indoor environments have been known to improve air quality in their immediate surrounds. Air exchange and adequate ventilation also mitigates indoor air quality problems.

PRESSURE – the driving forces

4.5 ENHANCED GREENHOUSE EFFECT

The earth naturally is located within a 'greenhouse' whereby water vapour, naturally occurring carbon dioxide (CO₂) and other gases such as methane (CH₄) trap reflected heat radiation from the earth's surface causing a warming effect. This maintains the temperature of the planet at a suitable level for life, and without this natural effect, the temperature of the globe would average minus (-)18 degrees Celsius.

The enhancement of this effect is contributed to by human activity such as the burning of fossil fuels and deforestation. Burning fuels or releasing gases add to the insulating properties of the gaseous atmosphere. CO₂ and methane are released through many industrial processes, agricultural practices, waste decomposition, electricity generation and transportation from carbon bases fuel combustion.

Vegetation removal reduces the natural ability of the planet to absorb CO₂ from the atmosphere through photosynthesis (known as 'carbon sequestration').

4.5.1 Ozone Thinning

Ozone at high altitude in the atmosphere (the stratosphere) acts as a shield for much of the UV radiation directed at the earth from the sun, by selectively absorbing certain wavelengths of energy. Impacts from chemicals in the atmosphere have caused a thinning of this layer allowing more UV radiation to the earth's surface. Although damaging chemicals such as chloro-fluoro-carbons (CFCs) have not been used for a number of years, damage continues to occur from chemicals in car exhausts and from industry. The increased radiation can lead to a greater risk of skin cancer in people, and can create environmental stress, therefore affecting a wide variety of species.

4.5.2 Ozone Depleting Substances

Humans have damaged the ozone layer by adding molecules containing reactive chemicals into the atmosphere. They drift up to the stratosphere, pushed by winds and atmospheric mixing. Since ozone concentrations are higher than most of the reactive chemicals in the stratosphere, the ozone destroyers of concern are those that can be responsible for destroying tens to hundreds of thousands of ozone molecules.

4.5.3 Agricultural Stock

It is widely acknowledged that methane is a significant greenhouse gas and that beef and dairy cattle and other cud chewing livestock are major contributors of methane to the atmosphere, as well as carbon dioxide. However, the exact contribution of these primary industries in the Tamworth region has not been quantified.

4.5.4 Vegetation Clearing

Vegetation acts as the lungs of the earth, exchanging Carbon Dioxide from the atmosphere for Oxygen. The ongoing removal of vegetation for development and agriculture results in the loss of capacity of the landscape to absorb the addition CO₂ created through the above human activities. This therefore adds to the pressure on the atmosphere in providing a natural level of insulation and accelerates global warming. Regulations preventing large scale vegetation clearing have been introduced in most states.

4.5.5 Landfill Gases

Landfill (and to a much smaller extent sewage plants) produce methane and carbon dioxide during decomposition, thus contributing significantly to greenhouse gas emissions.

4.5.6 Local Atmosphere

Good air quality is a prerequisite for good environmental and human health. As the region grows, it is possible that local air quality (particularly in Tamworth) may decline unless significant effort is made to allow for more transport options such as bicycle and walking tracks and more effective public transport solutions that do not involve the combustion of pollution generating fossil fuels.

Many of the major pollutants generated locally can cause health problems in people. They are usually related to respiratory problems or irritation of the eyes and mucous membranes in the throat and nose. Ozone for example, which is formed from nitrogen oxides reacting sunlight with organic compounds, is the main constituent of photochemical smog and causes irritation with the lungs. The health effects of major air pollutants are shown in Table 4.1.

Table 4.1 Human health and environmental impacts of atmospheric pollutants

Pollutant	Characteristics	Major Sources	Human Health Impact	Environment Impact
Carbon Monoxide (CO)	A colourless, odourless, highly toxic gas	Combustion processes: <ul style="list-style-type: none"> • car emissions; • wood burning; • power generation 	CO combines with haemoglobin in the blood in preference to oxygen. Thus depriving the body of oxygen. Prolonged low level exposure is thought to impair nervous function and be a factor in heart disease.	CO affects animals in the same way it affects people.
Particulate Matter	Solid or liquid particles ranging in size from 0.1 to 50 micrometers (µm). Particulates can include aerosols, mists, fumes, smoke and dusts.	Combustion products: <ul style="list-style-type: none"> • wood burning (up to 40% of all particulate matter); • cars; • diesel; • dust sources; • unsealed roads; • erosion. 	Large particles are usually trapped by mucus in the throat or lungs. Small particles (those less than 10µm diameter) penetrate deep into the lungs. Here they can cause respiratory problems or are absorbed into the bloodstream.	Particulate pollution can sometimes be seen as brown haze. Fine particulates can significantly affect visual amenity.
Volatile Organic Compound (VOCs)	Objectionable odour often colourless. Includes hydrocarbons,	Incomplete combustion of wood	High concentrations can lead to drowsiness and respiratory	Contributing factor to photochemical smog

Pollutant	Characteristics	Major Sources	Human Health Impact	Environment Impact
	oxygenates, phenols, benzene and organic acid.		problems. Some, such as benzene, are toxic.	
Nitrogen Oxides NO _x	These include NO which is colourless and odourless, and NO ₂ which is a toxic reddish brown gas with a choking odour.	<ul style="list-style-type: none"> • Vehicle emissions. • Combustion based electricity generation. 	Nitrogen dioxide particularly, can create increased respiratory infections and affect asthma sufferers.	Nitrogen oxides are known to contribute to acid rain. They also react with hydrocarbons to produce photochemical smog.
Sulfur Dioxide SO ₂	A colourless gas. It has a very stong odour.	Produced during combustion of fossil fuels such as in power generation and motor vehicles, also from some industrial processes.	Can cause respiratory problems, particularly affects those with conditios such as asthma, emphysema, etc.	Combines with water in the atmosphere to produce acid rain. It can also react to form sulphate particles. These are known to damage vegetation and buildings.
Lead (Pb)	Present as particulate matter in the atmosphere.	Leaded petrol and small contribution from industrial sources.	Lead can affect nearly all organs of the body. Lead in children can result in impaired growth, reduced hearing, learning disabilities and behavioural problems.	Lead is toxic to most organisms and can cause growth problems as well as reproductive problems in some species.
Air Toxics	Potentially toxic substances and combinations of substances measurable in ambient air.	Motor vehicle exhaust, fuel vapour, smoke/exhaust from wood-burning, dry cleaning and spray painting solvents. Also point sources such as chemical plants, oil refineries, electroplaters, incinerators.	Inhaled but may also contaminate water and soil and be ingested with food. They may also enter the food chain in this way. Various effects depending on their nature, period and concentration of exposures, from irritation to cancer, reproductive abnormalities and impairment of nervous system.	Some air toxics are naturally concentrated by animals, leading to high levels in those near the top of the food chain. Some have been blamed for reduction in biodiversity and seal and dolphin populations.

Source: Environment Protection Authority:
<http://www.environment.nsw.gov.au/envirom/princairpol.htm>

4.6 AIR QUALITY

4.6.1 Diffuse Air Pollutants

In addition to transport (discussed later), the major pressures on air quality in the Tamworth region over the 2004-2005 period continue to be from sources such as vehicle emissions, backyard burning, smoke from solid fuel stoves and heaters, dust from unsealed roads and extractive and other industries, landfill emissions and emissions from various licensed premises. Some agricultural activities including burning-off, present local pollution problems for some residents, particularly as rural residential districts expand in traditionally agricultural areas.

A wide range of equipment, including lawn mowers, chainsaws etc used in both rural and urban areas contribute to the emission of pollutants and greenhouse gases.

Agricultural activities can be a source of airborne pollutants in the form of spray drift from the use of pesticides and herbicides, or from other agricultural applications. Inappropriate use of sprayed chemicals can be the cause of major health problems for some people, while odours from spraying operations may also be considered a pollutant (rather than merely an irritation).

Dust frequently becomes a problem for residents in the vicinity of unsealed rural roads or development sites during dry periods. Dust may also be created by certain agricultural operations if soil is exposed to the wind.

Tobacco burning produces a complex mixture of gases, vapours and particulate matter. More than 4,500 compounds have been identified from burning tobacco and 50% of these are known or suspected carcinogens. These compounds not only affect the person smoking, but anyone in close proximity who inhales the smoke.

4.6.2 Licenced Air Emissions

Licences for emissions to the atmosphere are regulated by the EPA under the Protection of the Environment Operations Act. Industry is potentially a major contributor to both local and global air quality issues. Tamworth Regional Council has 40 premises with licences granted under the POEO Act. Further information can be obtained from the Public Register and SoE*direct* on the EPA website. www.environment.nsw.gov.au

4.6.3 Airport Emissions

Tamworth has one regional airport and a number of smaller infrequently used airfields. Certain emissions are characteristic of airport operations, including:

- ◆ unburnt hydrocarbons;
- ◆ volatile organic compounds;
- ◆ carbon monoxide;
- ◆ carbon dioxide;
- ◆ oxides of nitrogen;
- ◆ sulphur oxides;
- ◆ fire particle matter;
- ◆ lead;
- ◆ odours;
- ◆ dust;
- ◆ chlorofluorocarbons;
- ◆ sulphur dioxide.

4.6.4 Sewage Treatment Plants

Odours may sometimes be associated with sewage treatment or sewage reticulation systems. The odour impact of a treatment plant or reticulation system including pumping stations is measured in odour units (OU). Odour complaints can be expected in the range of 2-10 OU depending on numerous environmental and community factors. The likelihood of receiving an odour complaint increases with the number of people exposed to the odour and the EPA odour performance criteria given in its 1999 discussion paper on stationary odour sources includes the criterion of 2 OU for urban populations (equal to or above 2000).

4.6.5 Solid Fuel Stoves and Heaters

Smoke from wood burning contains a mixture of pollutants including carbon monoxide, fine particulate matter and volatile organic compounds. Other elements may be present in small amounts, but may become important in the consideration of factors such as odour, toxicity, corrosion and dust fallout. These include Nitrogen, Sulphur, Phosphorus, Chlorine, Potassium and Magnesium.

Domestic solid fuel heaters are a significant source of fine particle pollution in NSW in winter. These pollutants can affect human health, especially in older people, children and those with respiratory diseases. Gas or wood stoves that have not been flued properly may allow those pollutants to remain indoors at high concentrations.

Solid fuel stoves and heaters are quite common in both old and new residential areas. Inappropriate fuels, weather conditions (mainly during winter months) and poorly located flues can contribute to smoke nuisances and odour problems. The EPA website has a variety of information about selecting fire wood, wood heaters and correct burning techniques.

4.7 ELECTRICITY CONSUMPTION

Although there are no power stations within the Tamworth area, the consumption of electricity from coal fired power stations for heating, cooling and other uses is a major contributor to the total greenhouse gas emissions of the Tamworth community. The growing demand for electricity from increasing residents and visitors adds to the total contribution of the Tamworth region to global greenhouse gas emissions, unless major changes to renewable energy sources are made by both providers and consumers of electricity.

Per capita electricity consumption in Australia was estimated at 11,299 kWhrs in the Sydney Morning Herald 10-11 September 2005. Tamworth Regional Council has continued to monitor its energy use in Ray Walsh House over the past year. Electricity consumption (excluding tenants) was 1,070,254 kilowatt hours (kWhrs) a significant decrease of 216,462 on the previous reporting period 2003-2004 of 1,286,716 kWhrs as shown in Figure 4.2.

This remains a significant reduction from the peak electricity consumption during the 1999/2000 reporting period which was 1,701,650 kWhrs. The Greenhouse gases generated in connection with electricity use from Ray Walsh House were estimated at 974 tonnes during 2004-2005 or around 50% of the gases generated in all of Council's main buildings.

Figure 4.2 Electricity consumption in Ray Walsh House

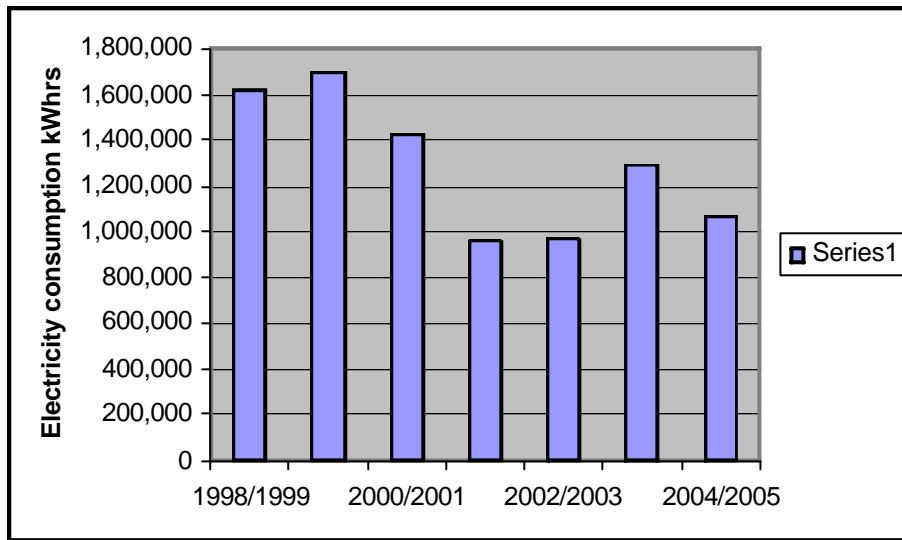
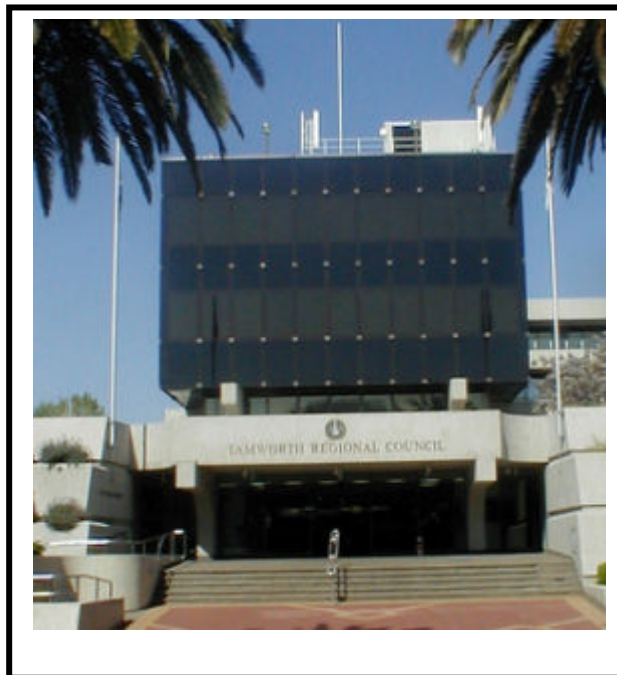


Figure 4.3 Ray Walsh House, Tamworth



Monitoring has also commenced on electricity consumption at a number of other Council sites which are significant consumers of electricity. These are shown in Table 4.3 along with greenhouse gas contributions.

Table 4.2 Electricity consumption at selected Council sites

Facility	1st Quarter Jul-Sept 04	2nd Quarter Oct-Dec 04	3rd Quarter Jan-Mar 05	4th Quarter Apr-June05	Total
1. Barraba Admin office	5453 kWh 4.89 tonnes	5565 kWh 4.99 tonnes	6137 kWh 6.47 tonnes	6091 kWh 6.42 tonnes	23246 kWh 22.77 tonnes
2. Barraba Depot	4964 kWh 4.44 tonnes	3477 kWh 3.12 tonnes	4714 kWh 4.97 tonnes	4484 kWh 4.97 tonnes	17639 kWh 17.5 tonnes
3. Manilla Admin office	4769 kWh 4.28 tonnes	7788 kWh 6.99 tonnes	5928 kWh 5.32 tonnes	6481 kWh 6.83 tonnes	24966 kWh 23.42 tonnes
4. Manilla Depot	153 kWh 0.14 tonnes	310 kWh 0.28 tonnes	431 kWh 0.39 tonnes	463 kWh 0.49 tonnes	1357 kWh 1.3 tonnes
5. Nundle Admin Office	15756 kWh 14.13 tonnes	6625 kWh 5.94 tonnes	8833 kWh 9.31 tonnes	8662 kWh 9.13 tonnes	39876kWh 38.51 tonnes
6. Nundle Depot	4861 kWh 4.34 tonnes	3458 kWh 3.10 tonnes	3197 kWh 3.37 tonnes	4398 kWh 4.64 tonnes	15914 kWh 15.45 tonnes
7. Parry Building	Data not available	124382 kWh 106.07 tonnes	81005 kWh 72.14 tonnes	87680 kWh 87.85 tonnes	293067 kWh 266.06 tonnes
8. Parry Depot	19659 kWh 17.63 tonnes	12354 kWh 11.08 tonnes	18677 kWh 19.69 tonnes	13269 kWh 13.99 tonnes	63959kWh 62.39 tonnes
9. Tam'rth RWH	316308kWh 269.71 tonnes	254766 kWh 217.76 tonnes	264752kWh 251.19 tonnes	234428kWh 235.00 tonnes	1070254kWh 973.66 tonnes
10. Tam'rth Depot	20493 kWh 18.38 tonnes	23787 kWh 21.34 tonnes	22556 kWh 23.77 tonnes	23716 kWh 22.00 tonnes	90552 kWh 85.49 tonnes
11. Tam'rth TREC	183957kWh 156.86 tonnes	36636 kWh 31.24 tonnes	80364 kWh 70.02 tonnes	84341 kWh 84.50 tonnes	385298 kWh 342.62 tonnes
Total					2,026,128kWh 1849 tonnes

4.8 TRANSPORTATION AND FUEL CONSUMPTION

Motor vehicles for a range of transportation purposes emit both local air pollutants and atmospheric or greenhouse gas pollutants. The issue of transportation is therefore relevant to both local and global atmospheric conditions, however it is discussed in this section as it has great significance for the issue of global warming.

Vehicles are a major contributor to air pollution. In urban areas they are responsible for the vast majority of lead emissions, although the proportion of lead free cars continues to increase. Motor vehicles contribute significant amounts of carbon monoxide, hydrocarbons and nitrogen oxides. Older passenger cars contribute far more pollution than newer cars (providing they are well maintained).

Particle pollution is also created by vehicle emissions and diesel vehicles contribute a substantial proportion of this pollution.

According to a State of the Air Report recently released by the Australian Government, the phase out of leaded petrol has led to declines in levels of lead in the air of Australian cities. Levels of carbon monoxide, sulphur dioxide and (to a lesser extent) nitrogen dioxide have also fallen significantly. However, average levels of ozone are rising and approaching the national one-hour limit, while levels of particles (PM10) are close to the 24-hour limit.

Like most inland regions, the population of the Tamworth region relies on the use of private motor vehicles for much transportation and motor vehicles are the dominant contributor of mobile source emissions within the area. A number of factors contribute to the maintenance of this relatively car centred transportation system, including:

- ♦ distances between urban centres;
- ♦ hilly topography of much of the area;
- ♦ a generally inadequate public transport system; and
- ♦ the absence to date of a response by the community as a whole which systematically addresses this issue.

While vehicles are becoming more fuel efficient and less polluting, the number of vehicles increases, particularly off-road passenger vehicles, putting greater pressure on the local and global atmosphere.

Action for Air, the NSW Government's 25-year Air Quality Management Plan, was released in 1998. The plan highlights the Roads and Traffic Authority (RTA) role in reducing vehicle emissions through:

- ♦ Advocating for new, tighter national fuel quality and emission standards for vehicles.
- ♦ Reducing emissions from in-service vehicles.
- ♦ Promoting alternative fuels.

Photochemical smog is a whitish haze formed from the action of sunlight on chemical compounds. Two of the most significant components are ozone and oxides of nitrogen (NO_x). Motor vehicles contribute approximately 80 per cent of NO_x to the atmosphere in the GMR. Particle pollution is evident as the brown haze sometimes seen in the cooler months of the year. It is composed of airborne particles of which approximately 24 per cent are from motor vehicles, with approximately 80 per cent from diesel vehicles.

Tamworth Regional Council has a vehicle fleet of 356 cars, utilities, trucks and plant for road maintenance and construction and park maintenance. Additional plant is hired when required and contractors to Council often supply plant. Council's estimated

use of diesel and unleaded fuel is summarised in Table 4.3 with an approximation of green house gas contribution.

Table 4.3 Tamworth Regional Council estimated fuel consumption

	Diesel	ULP	Total
Litres	1,045,217	526,283	1,571,500
Greenhouse Gases (tonnes)	2,822	1,316	4,138

Note: Figures are based on Australian Greenhouse Office figures quoted in the Sydney Morning Herald 20th August 2005 – 2.5 kilograms of carbon dioxide is released for using 1 litre of ULP while 2.7 kilograms is released from 1 litre of diesel. These figures are indicative only and are not an exact figure for all the fuel used by Council. Greenhouse Gas generation figures relate only to gas generation from Council vehicle or plant exhaust and do not take into account gases generated during the production of the diesel or ULP or generated in transporting the fuel to Council.

Greenfleet estimates the average car generates 4.3 tonnes of CO₂ per year.

4.9 COMPLAINTS

Council continues to respond to individual incidents as they arise and there are Council officers available 24 hours a day for this purpose. During the year 2004-2005 Council received 1333 complaints from the public. Only 77 or 5.7% related to pollution as shown in Table 4.4. The EPA received 26 pollution line complaints for the whole Regional Council area during 2004-2005 whereas there were 32 for the former Tamworth City Local Government Area alone in 2003-2004. Of the 26 complaints received in 2004-2005, 11 were air-related.

Table 4.4 Tamworth Regional Council pollution complaint

Type of pollution	Number of Complaints	Percentage of Total Complaints
Air	55	4.1
Industrial	3	0.2
Water/general	19	1.4
Total	77	5.7

Table 4.5 EPA Pollution line complaint by year

	2002-2003	2003-2004	2004-2005
Number	50	32	26

RESPONSE – the policies, plans and actions

4.10 THE KYOTO PROTOCOL

The Kyoto Protocol is an international treaty designed to limit global greenhouse gas emissions. Many parties to the United Nations Framework Convention on Climate Change (UNFCCC), including Australia, have signed the Protocol since negotiations were concluded at the third session of the Conference of the Parties to the UNFCCC (COP 3).

Australia signed the Kyoto Protocol in 1997. By signing the Protocol, countries agree to continue with the treaty-making process, but do not consent to be bound by the Protocol. The rules for implementing the Protocol were developed following COP 3, with negotiation concluded at COP 7 in Marrakesh, November 2001. After coming into force, the Protocol will be legally binding for countries that have ratified it (referred to as 'Parties to the Kyoto Protocol').

The Government has decided not to ratify the Kyoto Protocol at present, arguing that it is not in Australia's interest to do so. The Government is committed, however, to Australia's target, agreed under the Kyoto Protocol, of limiting greenhouse gas emissions to 108% of 1990 levels over the period 2008-12.

4.11 MANDATORY RENEWABLE ENERGY TARGET

The Australian Government has maintained the Mandatory Renewable Energy Target (MRET) scheme. The MRET scheme is a legislated national renewable energy market based on an innovative system of tradeable certificates.

The Australian Government's MRET, which commenced in April 2001, required the sourcing of 9,500 gigawatt hours of extra renewable electricity per year by 2010 through to 2020 – which is enough power to meet the residential electricity needs of four million people.

MRET places a liability on wholesale purchasers of electricity to proportionately contribute towards the generation of the additional renewable energy. The target of 2% applies nationally, and is implemented through the Renewable Energy (Electricity) Act 2000.

4.12 THE GREEN VEHICLE GUIDE

The Commonwealth Government, Department of Transport and Regional Services and the Australian Greenhouse Office have developed an online rating scheme for the environmental performance of new vehicles sold in Australia. This site can be used to see how vehicles compare on greenhouse air pollution emissions: www.greenvehicle.gov.au.

4.13 NATIONAL GREENHOUSE STRATEGY

The Australian Government's response to concerns about the environmental, economic and social impacts of global warming was delivered in the Prime Minister's statement in November 1997 titled '*Safeguarding the Future: Australia's Response to Climate Change*'. This was followed by the National Greenhouse Strategy which was endorsed by the Commonwealth, State and Territory governments. The Strategy presents a comprehensive range of actions to tackle the wide-ranging causes of the greenhouse effect and its potential impacts on all aspects of the physical, biological, social and economic environments of Australia.

There are numerous other Commonwealth Government reports, programs and grants relating to greenhouse issues including *Climate Change Risk and Vulnerability* and *State and Territory Greenhouse Gas Emissions – An Overview*. This report states that Australia's total greenhouse gas emissions in 2002 amounted to 541.8 million tonnes and NSW total

emissions were 151.5 million tones. For NSW the three largest sectoral emissions were stationary energy 48%, transport 15% and agriculture 14%.

4.14 NATIONAL ENVIRONMENT PROTECTION MEASURE

In May 2005 the National Environment Protection Council released an issues paper the National Environment Protection (Ambient Air Quality) Measure (NEPM). The objectives of the NEPM are to ensure that-

- ♦ The people of Australia enjoy the benefit of equivalent protection from air, water and soil pollution and from noise, wherever they live and
- ♦ Decisions by business are not distorted and markets are not fragmented by variations between jurisdictions in relation to the adoption or implementation of major environment protection measures.

The issues paper reviews recent health information, analyses monitoring results, reviews overseas trends and considers ozone standards.

4.15 NSW GREENHOUSE STRATEGY

A study was released in July 2004 on Climate Change in NSW by the CSIRO for the NSW Greenhouse Office to assess past climate variability and projected changes in average climate. The report notes that there is "new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities and that recent climate changes have already affected many physical and biological systems. It further states that:

- ♦ Some human systems have been affected by recent increases in floods and droughts,
- ♦ Natural systems are vulnerable to climate change and some will be irreversibly damaged,
- ♦ Many human systems are sensitive to climate change and some are vulnerable;
- ♦ Confidence in the ability of models to project future climates has increased,
- ♦ Atmospheric composition will continue to change throughout the 21st century,
- ♦ By the year 2100, global average temperatures may rise 1.4 to 5.8° and global average sea-level may rise 9 to 88 cm, relative to 1990, if there are no explicit policies to limit greenhouse gas emissions,
- ♦ Projected changes in climate extremes could have major consequences,
- ♦ If carbon dioxide (CO₂) concentrations are established through reductions in net emissions, some of the more serious damage associated with high rates of warming may be avoided, and
- ♦ Since global warming cannot be avoided completely, adaptation will be necessary to complement efforts to reduce net greenhouse gas emissions.

This report (CSIRO, 2004) also confirms that reductions in CO₂ emissions do not immediately lead to reductions in the CO₂ concentrations that influence global warming due to time lags in the global carbon cycle. Predictions concerning future temperature increases, rainfall and sea level rises, are also provided in this report.

The Australian Institute (2004) released an analysis of Australia's position in the global context in terms of CO₂ emissions, which now stand at 27 tonnes of CO₂ per person. This is twice the average for industrialised countries and Australia collectively emits more than France or Italy, which both have populations near 60 million.

In addition, despite some regulation, land clearing in Australia is also occurring at a significant rate, which itself generates greenhouse gases as vegetation is left to rot or is burnt, as well as reducing the ability to absorb these gases from the atmosphere.

The report included the following comments-

4.15.1 Temperature

From 1950 to 2003, the NSW annual mean maximum temperature rose to 0.15°C/decade and the NSW annual mean minimum temperature rose 0.19°C/decade. There has been an increase in hot days (35°C or more) of 0.10 days per year, an increase in hot nights (20°C or more) of 0.26 nights per year, a decrease in cold days (15°C or less) of 0.22 days per year and a decrease in cold nights (5°C or less) of 0.29 nights per year.

4.15.2 Rainfall

NSW annual total rainfall has decreased 14.3mm/decade since 1959, dominated by high year-to-year variability. Many El Niño years (such as 1965, 1982, 1994 and 2002) were associated with very low rainfall. The highest recorded proportion of the state with extremely low annual rainfall is 76% in 2002. During the 2002 drought, the low rainfall was accompanied by the highest mean maximum temperatures on record, but close to average mean minimum temperatures. It is likely that the impact of the 2002 drought would have been exacerbated by temperature rises resulting in increased evaporation and water demand. Decreases in the annual intensity and frequency of extreme daily rainfall events in NSW are consistent with the decline in annual mean rainfall since 1950, with strongest decreases at coastal locations.

4.15.3 Sea Level Rise

Mean relative sea-level rise (including land movement) around Australia of about 1.2mm/year was recorded over the period 1920 to 2000. In Sydney, the frequency of extreme sea-level events reaching 2.1 or 2.2m has doubled or tripled, respectively, since 1950.

4.15.4 Strategies

Climatic change and greenhouse gases are being tackled through a broad NSW State strategy set in the context of the National Greenhouse Strategy-which is the key institutional driver for the development of renewable energy sources, research and development policy, and improved energy efficiency in the community.

The effort is spearheaded by the NSW Sustainable Energy Development Authority (SEDA), established in 1996 to reduce the level of greenhouse gas emissions in NSW by investing in the commercialisation and use of sustainable energy technologies. The NSW strategy also includes proactive legislative reform of the electricity industry, as well as programs to control clearing of native vegetation. Because the transport sector is a major generator of greenhouse gas emissions in NSW, further benefits will flow from implementing *Action for Air*.

The relationship between greenhouse gas abatement and air quality strategies is complex. Although reducing fossil fuel emissions will improve overall air quality, some strategies may put pressure on local and regional air quality. For example, cogeneration results in lower overall greenhouse-gas emissions by improving the efficiency of energy use, but it inevitably creates NO₂. The need for reducing greenhouse gas emissions will have to be balanced with the need to improve regional and local air quality.

Implementation of the NSW Ozone Protection Regulation 1997 has brought NSW in line with national policies on ozone protection and control of hydrochlorofluorocarbons.

During 2004 the NSW Government released the NSW Greenhouse Strategy Discussion Paper for public comment as the first stage in developing a strategy for the state. The Goals of the Strategy are –

- ♦ Limit the growth of NSW Greenhouse gas emissions,
- ♦ Put NSW on a long term path towards a prosperous economy with low net carbon emissions,
- ♦ Raise awareness of all greenhouse issues among the broader NSW community to drive action to reduce emissions by individuals and
- ♦ Deepen our knowledge of climate change impacts on NSW, and, where appropriate, begin adaption processes.

The guiding principles for the Strategy are –

- ♦ Partnerships should be developed in recognition that action on greenhouse is a responsibility for all of NSW, including individuals, industry, commerce, community groups and Government,
- ♦ Where possible actions that reduce our greenhouse emissions should be targeted to achieve co-benefits, such as mitigation of salinity, decrease local air pollution, revegetation, regional employment or industrial development,
- ♦ Greenhouse aims should be consistent with economic, social and other environmental aims for NSW,
- ♦ An effective balance needs to be achieved between obtaining short-term, least cost abatement and developing a long term, sustainable society with low net carbon emissions and
- ♦ For a comprehensive response, the range of actions should cover emissions generation, emissions reduction and emissions offset activities.

4.16 NSW AIR QUALITY

Recognising the need for a comprehensive plan to make sure the air we breathe is clean, the NSW Government has combined scientific, health, urban planning and economic expertise with feedback from the community, industry and government to produce this plan. It is an ambitious initiative, seeking for the first time to develop a plan for air quality for the long-term, over a 25-year period. Everybody is being asked to take responsibility-government, the community and industry, because integrated solutions are the ones that will work in the long-term.

Setting an air quality plan with goals, objectives and actions over 25 years is very ambitious but it is necessary. It is not a coincidence that NSW is now realising air quality gains from air pollution programs that were put in place in the mid 1980s. The NSW Government Report Action for Air will provide us with the next set of gains; and be adapted as new information comes to light and the technological landscape shifts. The Plan concentrates on the Greater Metropolitan Area-Sydney, Newcastle and Wollongong which contains about 70% of the State's population but is also relevant to the rest of the state.

The plan supports the Government's overall air quality agenda, which includes local, regional and global issues. *Action for Air* focuses on regional air pollution and includes a comprehensive attack on photochemical smog and fine particle pollution. The regional approach taken here draws strong links to local and global issues, especially the

Government's high priority campaigns to reduce greenhouse gas emissions and promote sustainable energy sources.

The plan is broad. It recognises that every action counts in tackling air pollution. It puts in place actions that will reduce emissions from motor vehicles as well as industrial and commercial sources and from everyday household activities.

The plan highlights the RTA's role in reducing vehicle emissions through:

- ♦ Advocating for new, tighter national fuel quality and emission standards for vehicles.
- ♦ Reducing emissions from in-service vehicles.
- ♦ Promoting alternative fuels.

The two pollution problems of prime concern in NSW are photochemical smog and particle pollution. These major pollutants cause smog, particle pollution, ground level ozone, nitrogen dioxide and total particulate matter.

4.17 GREEN POWER

Green Power is a nationally accredited program established in 1997. There are 12 retailers across Australia covering 96% of the population with 18 accredited products and more than 95,000 customers. Green Power generators include –

- ♦ Solar PV and solar thermal,
- ♦ Wind generators,
- ♦ Hydro on existing dams and mini hydro,
- ♦ Biomass including landfill – no native forest or old growth forest,
- ♦ Geothermal/hot dry rocks and
- ♦ Wave and tidal power.

Green Power is another way in which individuals, families, companies, corporations and local government can contribute by reducing the amount of greenhouse pollution released into the atmosphere. The benefits of buying accredited Green Power include –

- ♦ Providing a high profile commitment to improving the environment,
- ♦ Helping to position Council as a leading corporate citizen – users can be promoted on the green power website,
- ♦ Using the Green Power customer logo on marketing material,
- ♦ Providing an easy way to meet Council objectives and environmental policies,
- ♦ Providing a measurable greenhouse action to meet CCP goals and enhance environmental award applications.

4.18 GREENFLEET

Transport is Australia's fastest growing source of greenhouse gas emission. Greenfleet is a not for profit organization with a simple program to reduce this impact on the environment. For a small tax deductible donation Greenfleet plants 17 native trees that will create a forest that will absorb the greenhouse gases produced by one car each year (based on 4.3 tonnes of CO₂ for the average car).

Since 1997 Greenfleet has planted more than 2 million trees on behalf of Australian motorists and fleets. These trees will not be harvested so they will help to tackle salinity, improve water quality and provide essential habitat for native wildlife.

Corporate and government fleet owners can offset greenhouse emissions in two ways –

- ◆ A carbon offset based on average greenhouse emissions by cars and light commercials (4.3 tonnes of CO₂; \$40 per vehicle year is applied to the number of vehicles in the fleet. Greenfleet plants the number of trees required each year to absorb these emissions for a carbon neutral result. Or
- ◆ A carbon-offset based on annual energy use including vehicle fleet based on annual fuel usage, staff air travel and office energy usage.

4.19 CYCLEWAYS

The use of cycles contributes in a positive way to clean air by reducing the use of motor vehicles. The City of Tamworth is well catered for by the cycleway network. The Tamworth Bike Plan 1997 guides cycleway development though it should be recognised that departures for the priorities set and exact nature of works have been made. These variations in schedule have been compelled by natural events such as flooding of the Peel River and funding opportunities that have arisen.

In recent years the following cycleways have been completed:

- ◆ Calala Lane from Goonoo Goonoo Rd to Campbell Rd.
- ◆ No.1 Oval from levee to Kable Av.
- ◆ Goonoo Goonoo Rd from Gipps St to George St.
- ◆ Peel St. from Murray St to East St.
- ◆ Goonoo Goonoo Ck Bridge – Cantilevered footpath (West side).
- ◆ Scott Rd from Peel River to Goonoo Goonoo Rd.

Several of these projects were funded on a 50:50 basis by the RTA and Council. In the past the RTA has contributed to cycleways in other towns such as Kootingal.

4.20 TAMWORTH AIR QUALITY MONITORING STATION

Due to the light nature of the industry in the region and wind and climate patterns that act to disperse local air pollutants the region does not generally suffer from the haze or smog problems that effect many other areas. Occasionally there may be dust blown in from further west or minor smoke haze from local or distant bushfires.

The Department of Environment and Conservation operates an air monitoring station in South Tamworth. Results for the first six months of 2005 are not available on the DEC website so the results for 2004 are shown in Figure 4.6. There were only two days in this period above NEPM Standard level. These days were in February and September 2004.

Table 4.6 DEC air quality monitoring data 2004

Particulate Matter: By Tapered Element
 Oscillating Microbalance (TEOM-PM1012)
 Micrograms per cubic metre at 0 degrees Celsius

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ALL HOURS IN MONTH: % Sampling time	87	95	90	95	98	89	86	38	86	81	69	***
Average	18	20	18	24	21	18	20	23	24	24	23	***
DAILY 1-HOUR MAXIMA: Monthly Average	47	52	44	58	54	52	55	66	60	58	66	***
90-percentile value	65	75	60	79	85	75	94	103	86	97	106	***
Maximum 1-hour Value	136	143	77	118	119	81	107	185	133	111	120	***
Maximum 24-hour Value	40	55	34	50	35	26	30	36	56	42	42	***
NEPM STANDARD LEVEL: No of Days ABOVE Level	0	1	0	0	0	0	0	0	1	0	0	***

*** Data not available

NEPM = National Environment Protection Measures

4.21 CITIES FOR CLIMATE PROTECTION (CCP)

The Australian Government has stated its committed to reducing greenhouse gas emissions to 8% above 1990 levels by 2010. This reduction is significant and requires the combined effort of all Australians. The Australian Greenhouse Office works with local government, industry and the community to reduce Australia's greenhouse gas emissions.

The Cities for Climate Protection™ (CCP™) Australia programme assists local governments and their communities reduce greenhouse gas emissions. The Prime Minister, in his statement 'Safeguarding the Future' in November 1997, funded the programme through a commitment of \$13 million over 5 years. CCP™ is an important component of the Australian Government's Local Greenhouse Action, which received funding of \$13.8 million in the May 2004 Federal Budget - extending the Australian Government's financial backing of CCP™ Australia to a decade.

CCP™ Australia is an international trade-marked programme of the International Council for Local Environmental Initiatives (ICLEI) delivered in collaboration with the Australian Greenhouse Office.

The programme commenced as a pilot in September 1998, and since then there has been an overwhelming response by Councils. As at August 2005 there were 206 local governments, representing almost 80% of Australia's population, that are committed to achieving sustainable, long-term reductions in their greenhouse gas emissions through their participation in CCP™ Australia.

Australian local governments lead the world in the number of participants involved, percentage of population covered and actions taken.

In 2004, CCP™ Australia celebrated its seventh year of operation and achieved a significant milestone - the programme delivered, for the first time, over one million tonnes of abatement within a 12-month period, taking total abatement for the programme to almost three million tonnes of carbon dioxide equivalent.

On joining CCP™ Australia, Councils commit to achieving five milestones by passing a council resolution. ICLEI supports councils to achieve these milestones and works with them to develop a strategic agenda to reduce their greenhouse gas emissions.

Table 4.7 Cities for Climate Protection Program milestones

CCP Milestone	
1	Establish an inventory and forecast for key sources of greenhouse gas emissions within Council.
2	Set an emissions reduction goal.
3	Develop and adopt a local greenhouse action plan to achieve reduction goals.
4	Implement Local Greenhouse Action Strategy.
5	Monitor and report on greenhouse gas emissions and implementation of actions and measures.

Throughout 2002 and 2003, the former Tamworth City Council achieved both Milestone 2 and Milestone 3 in the Cities for Climate Protection program. In order to achieve Milestone 2, Council adopted emission reduction goals in February 2003. Further to this achievement, Council prepared and adopted a Greenhouse Reduction Plan in May 2003. The Greenhouse Reduction Plan identifies a list of actions to be carried out to better manage Council's use of electricity and other energy sources. The plan also identifies ways Council can encourage the community to reduce energy consumption and reduce greenhouse gas emissions.

The plan serves as a strategic document and a starting point which will be updated annually as part of the management planning and budgeting process. This annual review will allow specific actions to be planned as information is collected and in response to council budgets. Several actions, mainly investigative, have been completed during 2004/2005. The Energy Team met early in 2004 to review current progress with the Plan but has been on hold since that time because of other priorities associated with the amalgamation.

4.22 AUSTRALIAN GREENHOUSE OFFICE GRANT

As part of Tamworth Regional Council's involvement with the Cities for Climate Protection Program™, Council was able to participate in the Australian Greenhouse Office Community Abatement Assistance Program. The project was called "Tamworth Regional Council Energy Study and Abatement Measures for Manilla and Barraba Offices".

The proposal was for the funds to be used to carry out the following works.

Energy Study of Manilla Office	\$1000
Energy Study of Barraba Office	\$1000
Retrofit Manilla Office	\$3000
Retrofit Barraba Office	\$3000

In December 2004 TRC accepted a quote from Country Energy Energy Answers to carry out the energy studies. Country Energy inspected the Manilla and Barraba Offices and consulted with the office staff. The Report was received in February 2005 and cost \$3570 + GST. The areas covered during the Energy Study and the potential estimated savings suggested in the Report included –

♦ Energy Management	5%
♦ Heating, Ventilation and Air Conditioning	10%
♦ Lighting	5%
♦ Office equipment	3%
♦ Kitchen Facilities	0%
♦ Hot Water Heating	2%
♦ Power Factor Correction	0%
TOTAL	25%

During March 2005 TRC staff at Manilla and Barraba were consulted over implementation of the report and their suggested priorities.

Figure 4.4 Barraba Office



Council staff targeted the lighting recommendations to achieve the best results in the limited time span of the grant. In April 2005 TRC electrical maintenance contractors Beselect Pty Ltd were engaged to replace the lighting in the Manilla and Barraba Offices with energy efficient tubes and starters at a cost of \$1694 + GST including 89 tubes at Manilla and 102

tubes at Barraba. Beselect Pty Ltd were subsequently engaged to supply and fit ECO Light 2.4 energy saving devices at a cost \$8120 + GST including four units at Manilla and seven units at Barraba. Total expenditure on the project to date has been \$13,384 + GST.

The involvement of the local staff and the transformation of these offices by upgrading the lighting has greatly increased enthusiasm for the project. Tamworth Regional Council has contributed \$5,384.00 to the project to date. Further opportunities to implement energy saving measures suggested in the Country Energy report will be undertaken from Council's maintenance budget. Country Energy will be publicising the project in their business newsletter.

It has been estimated that local government can influence up to 50% of their community's greenhouse emissions through energy use, planning regulations, disposal of waste, transport usage, purchasing policies and community and corporate decision making. Local Government can respond to growing community concern about the environment and proactively lead the way to a sustainable future.

Figure 4.5 Manilla Office



Many Councils have already responded to this community concern and implemented environmental programs to address specific local issues including air quality, biodiversity, climate change, land clearing and fragmentation, waste management, water management and stormwater management.

4.23 BASIX

BASIX was discussed in Section 2.16. BASIX is the Building Sustainability Index. It is a web-based planning tool designed to assess the potential performance of new homes against a range of sustainability indices: Landscape, Stormwater, Water, Thermal Comfort and Energy. BASIX aims to reduce the environmental impact of these features of new development and to produce homes that are more comfortable and cheaper to run than most existing homes.

The first stage of BASIX focused on reducing Water and Energy use. BASIX has set targets of these indices which all new development must meet. Landscape, Stormwater and Thermal Comfort indices are also activated because information relating to these indices impacts on water consumption and greenhouse gas emissions.

The BASIX online assessment required information about the proposed development, such as site location, dwelling size, floor area, landscaped area and services. BASIX compares

the proposal to average existing homes. The proposal is scored according to its potential to consume less mains supply water and energy than an average existing home.

From 1 July 2004, BASIX has been introduced in stages as a mandatory component of the NSW development approval process in NSW under the Environmental Planning and Assessment Act 1979. BASIX was introduced from that date through the Environmental Planning and Assessment Amendment (Building Sustainability Index: BASIX) Regulation 2004 and State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004.

The introduction of the building assessment sustainability index (BASIX) throughout NSW by July 2005 will extend the requirement for new dwelling houses to improve energy efficiency in terms of materials and design. BASIX will override the energy efficiency policy described above. The types of energy efficiency requirements to be assessed in relation to new buildings under the BASIX scheme will be flexible, but the targets will be the production of 25% less greenhouse gas emissions than average NSW homes of the same type.

The target for reduced greenhouse gas emissions will increase to 40% from 1 July 2006. These targets represent significant yet readily achievable savings in water use and greenhouse gas emissions by homes. New homes must also meet requirements in BASIX relating to the thermal performances of the building envelope. This requirement is aimed at ensuring that homes are not overly reliant on artificial heating and cooling, such as air conditioning, in order to be comfortable.

4.24 ACTIONS TO HELP THE ATMOSPHERE

- 1 Ensure that your car is running as efficiently as possible through regular tune ups and tyre pressure checks.
- 2 Walk or ride a bike to work / shops or car pool with friends, neighbours or colleagues.
- 3 Use public transport when and where available or lobby for better transport alternatives including public transport, cycleways and other options.
- 4 Buy Greenpower to support the development of renewable clean energy sources.
- 5 Consider changing to solar hot water system at next hot water purchase.
- 6 Consider insulation / lining, aspect, use of shade structures and strategic planting of appropriate vegetation for housing rather than use of air conditioning.
- 7 Buy energy efficient rated new products or second hand products / materials to ensure no wastage of the embodied energy they contain.
- 8 Turn off all unused lights and appliances at the power point and deactivate standby mode.
- 9 Compost or put out for collection garden waste rather than burning or including with garbage collection.
- 10 Buy locally grown and made products to minimise transport costs and greenhouse gas emissions.

Figure 4.6 View from the Hanging Rock near Nundle

