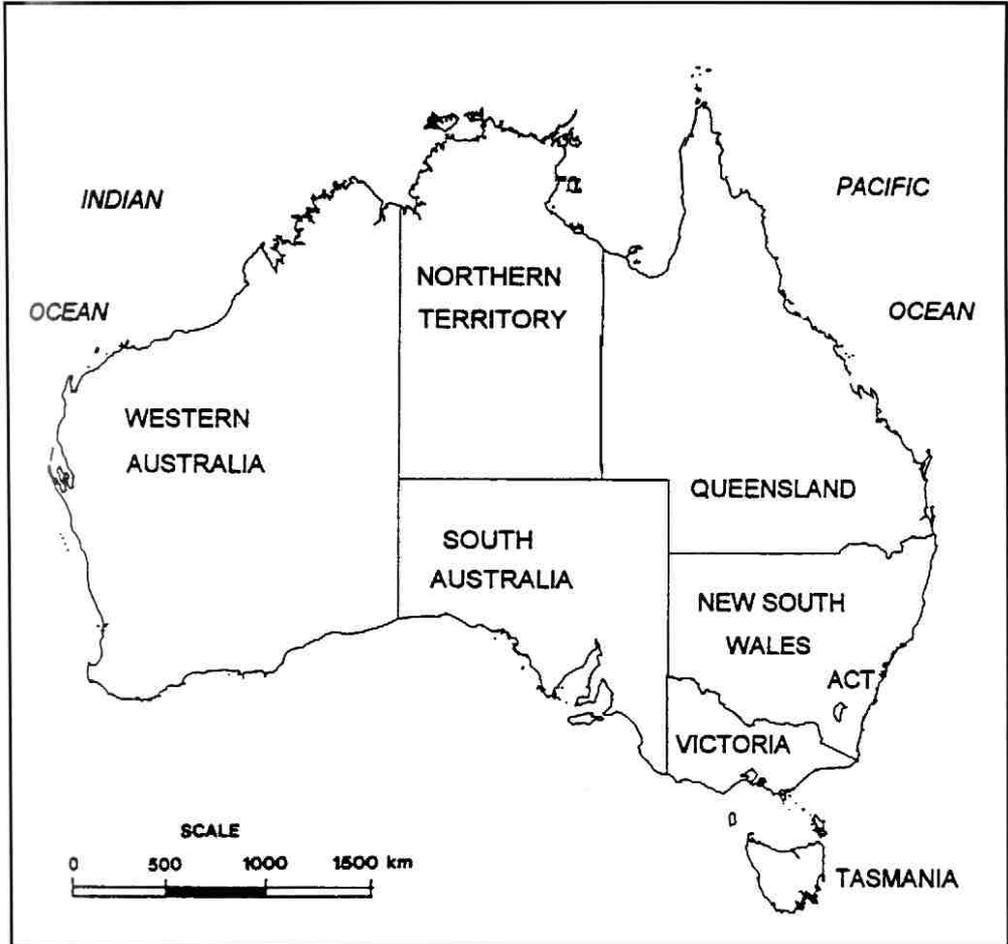


# Australia

Australia 5: Torrens River

Australia 6: Scott Creek



## **Introduction**

The continent of Australia is the lowest, the flattest and, with the exception of Antarctica, the driest of the continents with a total land area of 7 682 000 km<sup>2</sup>. The land lies between latitudes 10°41' S (Cape York) and 43°39' S (South East Cape, Tasmania) and between longitudes 113°09' E (Steep Point) and 153°39' E (Cape Byron). The latitudinal distance between Cape York and South East Cape, Tasmania is 3 680 km. The longitudinal distance between Steep Point and Cape Byron is about 4 000 km. There are two major classes of rivers in Australia, those of the coastal margins with moderate gradients and those of the central plains with very slight gradients. The continent has a wide range of climatic zones, from the tropical regions of the north, through the arid expanses of the interior, to the temperate regions of the south. Seasonal fluctuations can be great, with the temperatures ranging from above 50 °C to well below zero. The continent often experiences natural disasters, particularly droughts, floods, tropical cyclones, severe storms and bushfires. While the mean annual precipitation is 460 mm in Australia, it varies from 100 mm in the arid central plains to over 4 000 mm in the region with the highest mean annual rainfall on the north east coast of Queensland near the township of Tully. The overall population of Australia in 1993 was 17.7 million. The overall population density was 2 persons/km<sup>2</sup> with most of the population concentrated in coastal regions.

The two rivers catalogued in this volume are the Torrens River at Mt Pleasant and Scott Creek at Scott Bottom, both of which are located in the Mt Lofty Ranges in South Australia. The catchments are approximately the same size but have very different hydrological characteristics. Both these catchments occur in the wettest region of South Australia and were developed very early by European settlers in the 1840s and 1850s.

## **Acknowledgments**

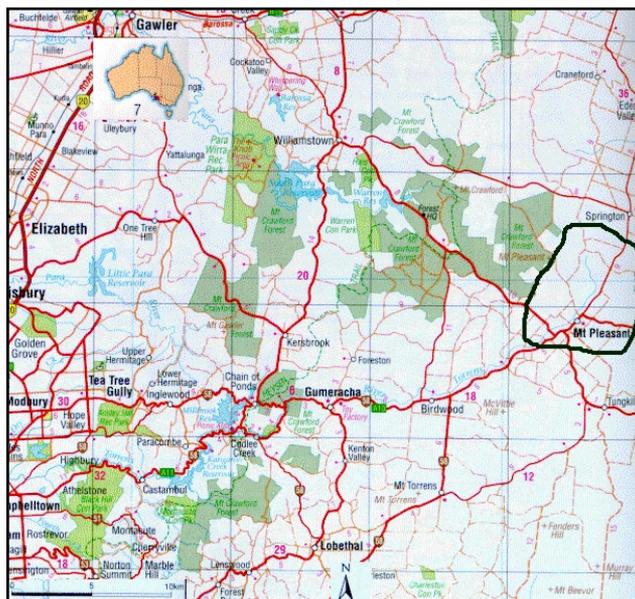
The following organizations are thanked for their assistance for the preparation of this work.

The University of Adelaide,  
Department of Environment Housing and Aboriginal Affairs, South Australia, and  
Bureau of Meteorology.

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# Torrens River

## Map of River



## Table of Basic Data

<b>Name:</b> Torrens River at Mt Pleasant (Upper Catchment of Torrens River AW504512)		<b>Serial No.:</b> Australia-5
<b>Location:</b> South Australia	S 34° 40' ~ 34° 50'	E 139° 00' ~ 139° 05'
<b>Area:</b> 25.9 km <sup>2</sup>	<b>Length of main stream:</b> 8 km	
<b>Origin:</b> Mt Pleasant-Partalunga	<b>Highest point:</b> Mt Pleasant 543 m	
<b>Outlet:</b> Gulf St Vincent	<b>Lowest point:</b> sub-catchment outlet ~420 m	
<b>Main geological features:</b> Cambrian with Quaternary formation along main river channel.		
<b>Main tributaries:</b> None		
<b>Main lakes:</b> None		
<b>Main reservoirs:</b> None		
<b>Mean annual precipitation:</b> 621 mm (1895~1997) (see isohyetal map)		
<b>Mean annual runoff:</b> 85.1 mm (1974~1998) at sub-catchment outlet		
<b>Population:</b> < 500	<b>Main cities:</b> Township of Mt Pleasant	
<b>Land use:</b> Natural Vegetation (1.2 %), Forest (0.4 %), Urban (1.5 %), Intensive Rural (2.9 %), Grazing (94 %)		

## 1. General Description

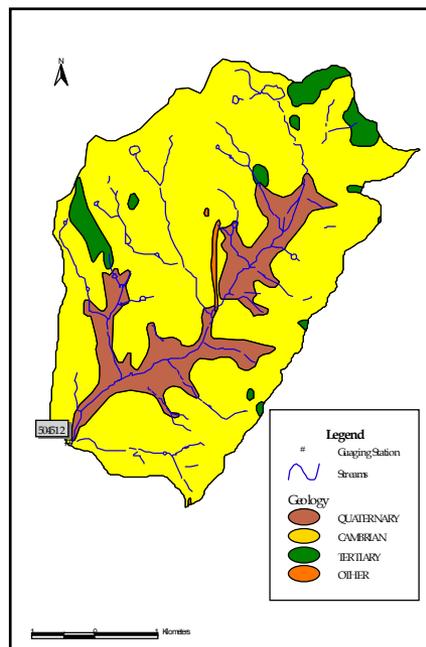
The Torrens River at Mt Pleasant has a catchment area of 25.9 km<sup>2</sup> and is located at the head waters of the Torrens Catchment in South Australia to the east of Adelaide. Flowing in basically a south westerly direction in this catchment, the length of the Torrens River to the Gauging Station is approximately 8 km. The total Torrens River Catchment area is approximately 508 km<sup>2</sup>, 80 % of which lies in the Adelaide Hills. The climate of the catchment is typically temperate with high maximum daily temperatures and evaporation in summer. Rainfall tends to occur in winter and spring (from May to October) with the bulk of the rainfall in the winter months. The topography is dominated by the high summit penneplain which provides a landscape of low relief. The upper river slope, east of Gumeracha, has an average gradient of 0.6 %.

The average catchment elevation is approximately 463 m. Overall, the soils of the catchment can be considered to be moderately permeable consisting of coarse sandy material overlying weathered rock. Grazing comprises the major land use in the catchment with some vineyards in the northern part of the catchment and native vegetation existing in the south western part of the catchment. The township of Mount Pleasant is situated in the south western part of the catchment adjacent to the River Torrens. Approximately 7 % of the catchment is irrigated, and due to the low rainfall, irrigation application rates tend to be higher than elsewhere in the catchment. A large portion of water for irrigation comes from captured surface water due to the high salinity levels in ground water. Within the Mt Pleasant catchment there are 117 dams.

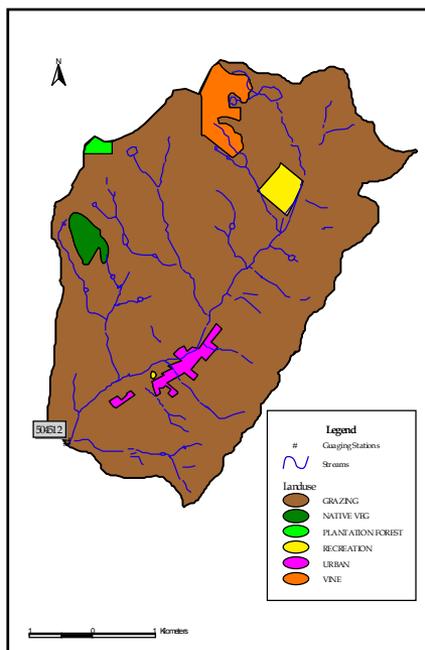
Issues within the Mt Pleasant catchment include dryland salinity, water quality, riparian zone health, lack of native vegetation, dam building and water use.

## 2. Geographical Information

### 2.1. Geological Map



## 2.2. Land Use Map

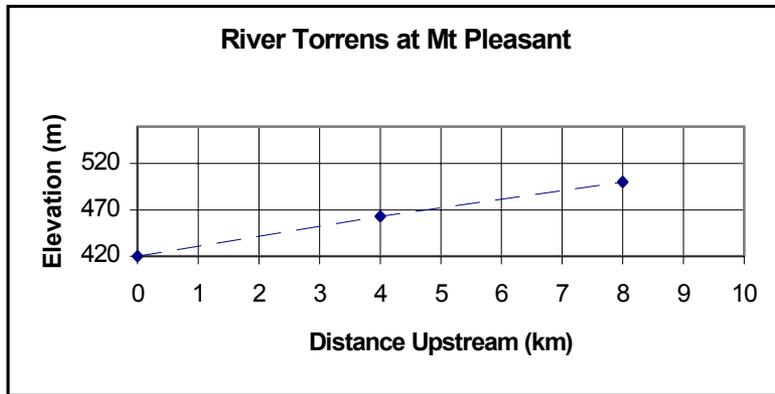


The land use within this catchment is principally grazing with some areas of intensive agriculture such as vineyards.

## 2.3. Characteristics of River and Main Tributaries

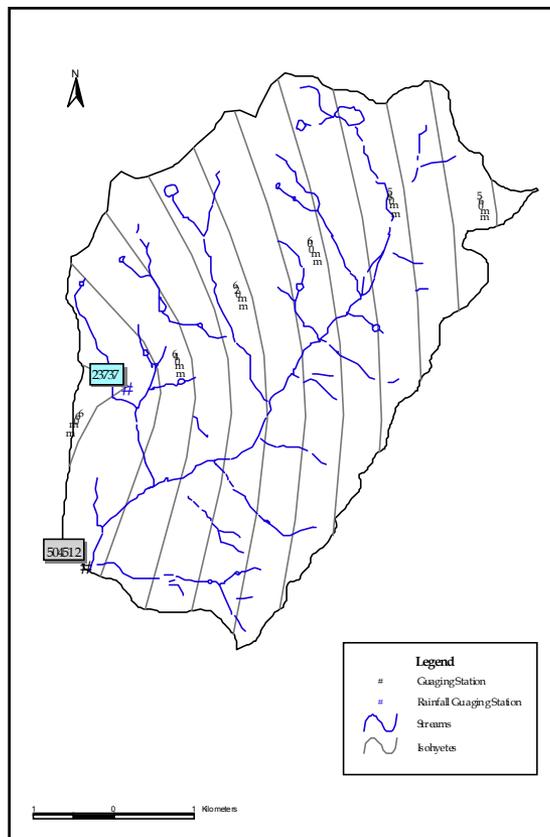
No.	Name of river	Length [km] Catchment area [km <sup>2</sup> ]	Highest peak [m] Lowest point [m]	Land use [%] (1998)
1	Torrens (Main river)	8 25.9	543 420	Natural Vegetation (1.2%), Forest (0.4%), Urban (1.5%), Intensive Rural (2.9%) Grazing (94%)

2.4. Longitudinal Profile



3. Climatological Information

3.1. Mean Annual Precipitation Map and Observation Stations



### 3.2. List of Meteorological Observation Stations

Station No.	Station	Elevation [m]	Location	Observation period	Mean annual precipitation [mm]	Mean annual evaporation [mm]	Observation items <sup>1)</sup>
023801	Lenswood Research Centre	452	S 34° 57' E 138° 48' 36"	1968~1998	1 041	1 280	P, E, T, DS, TB, DP
023737	Mt Pleasant	430	S 34° 46' 48" E 139° 03'	1895~1994	621		P
AW504512	Mt Pleasant GS	420	S 34° 47' E 139° 02'	1989~1999	512		TBP

1) P: precipitation (daily read rain gauge 203 mm); TBP: tipping bucket pluviograph; E: evaporation (Class A Pan - 120 cm); DS: duration of sunshine (hrs); DP: dew point; T: temperature.

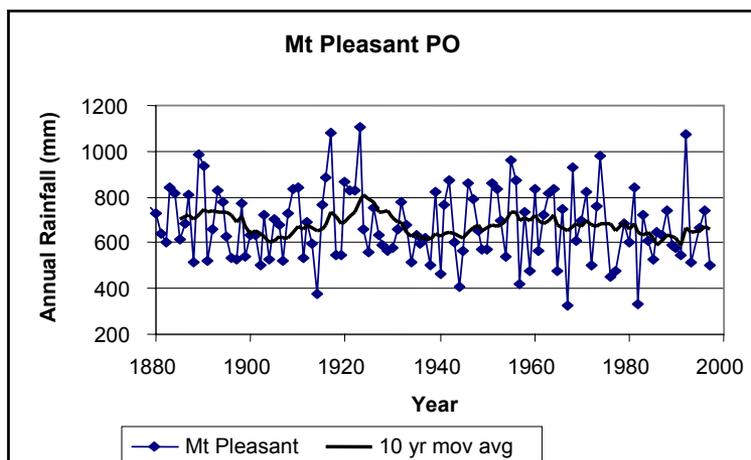
### 3.3. Monthly Climate Data

Observation item	Observation station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Period for the mean
Temperature [°C] Max.	Lenswood	25.2	25.7	22.8	18.9	14.9	12.0	11.4	12.4	14.5	17.7	20.6	23.2	18.3	1967~1996
Temperature [°C] Min.	Lenswood	12.9	13.5	12.3	10.7	8.6	6.7	6.0	6.3	7.1	8.5	10.0	11.6	9.5	1967~1996
Precipitation [mm]	Lenswood	35.1	27.6	43.2	78.7	112.5	134.1	165.6	151.4	117.9	82.4	46.5	46.4	1 041.4	1967~1996
Raindays [No.]	Lenswood	7.3	5.8	8.8	12.9	16.6	17.7	19.6	20.1	16.5	14.0	10.6	9.0	158.9	1967~1996
Evaporation [mm] (Pan) <sup>1)</sup>	Lenswood	196.2	168	136.4	81	49.6	33	33	49.6	72	114.7	141	176.7	1 251	1967~1996
Duration of sunshine [hr]	Lenswood	9.8	9.4	7.8	6.3	4.7	3.9	4.1	5.2	6.1	7.6	8.7	9.2	6.9	1967~1996

<sup>1)</sup> Class A Pan (120 cm)

Note: Lenswood is in an adjacent catchment

### 3.4. Long Term Variation of Annual Precipitation



## 4. Hydrological Information

### 4.1. Map of Streamflow Observation Stations

See Climatological Map

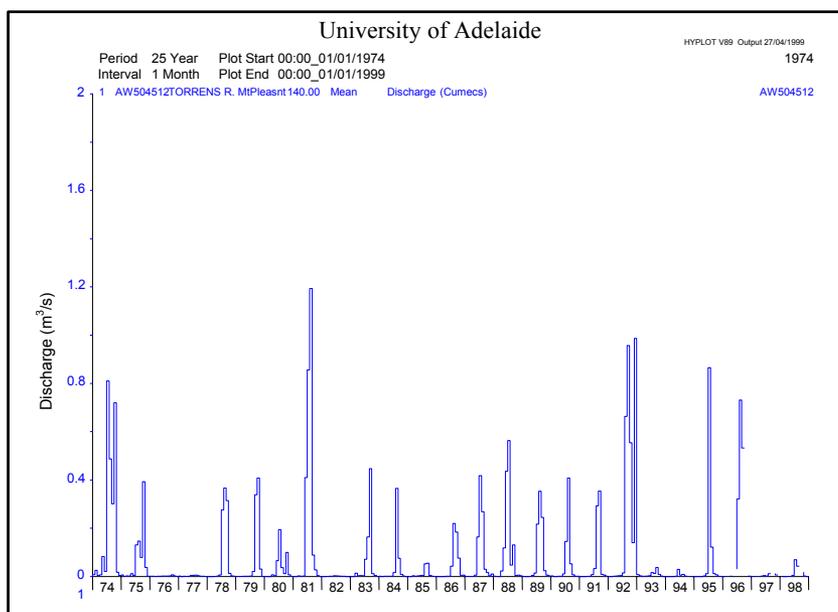
### 4.2. List of Hydrological Observation Stations

Station No.	Station	Location	Catchment area (A) [km <sup>2</sup> ]	Observation period	Observation items (frequency)
504512	Torrens River at Mt Pleasant	S 34° 48' E 139° 03'	25.9	1973~1997	Continuous height record , Rainfall

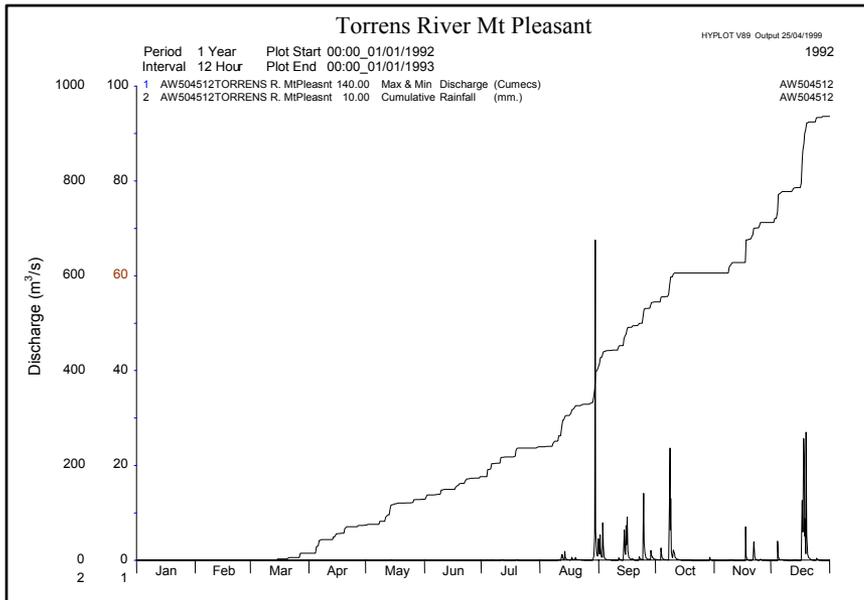
Station No.	$\bar{Q}$ <sup>1)</sup> [m <sup>3</sup> /s]	Q max <sup>2)</sup> [m <sup>3</sup> /s]	$\bar{Q}$ max <sup>3)</sup> [m <sup>3</sup> /s]	$\bar{Q}$ min <sup>4)</sup> [m <sup>3</sup> /s]	$\bar{Q} / A$ [m <sup>3</sup> /s/100km <sup>2</sup> ]	Q max / A [m <sup>3</sup> /s/100km <sup>2</sup> ]	Period of statistics
504512	0.076	67.64	0.279	0.002	0.3	260.	1973~1998

- 1) Mean annual discharge                      4) Mean annual minimum discharge  
 2) Maximum discharge  
 3) Mean annual maximum discharge.

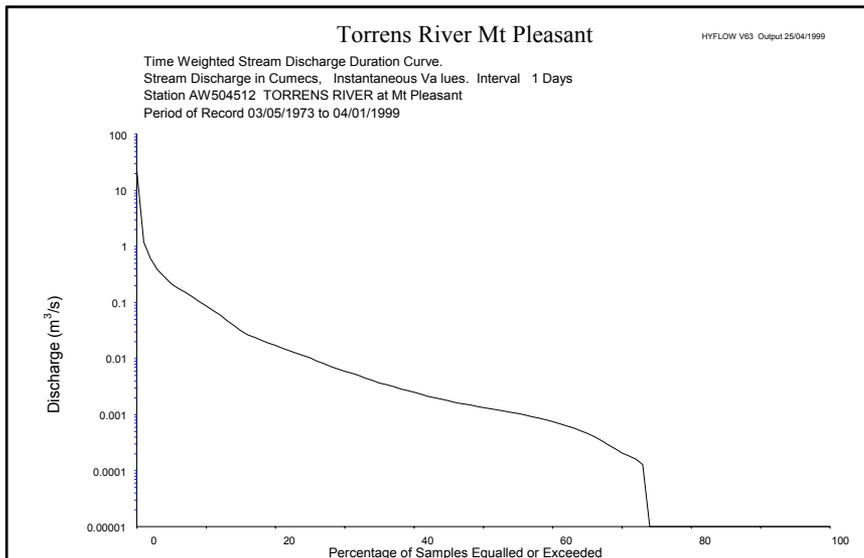
### 4.3. Long-term Variation of Monthly Discharge



#### 4.4. Annual Pattern of Discharge



Annual Plot of flows 1992



Flow Duration Plot [m<sup>3</sup>/sec]

#### 4.5. Unique Hydrological Features

Runoff from the Torrens River is highly seasonal, being concentrated in the winter spring seasons (June~October). During the summer seasons, the Torrens at Mt. Pleasant catchment, despite being at the upper boundary of the Torrens catchment, has a lower rainfall than most points of the catchment below it.

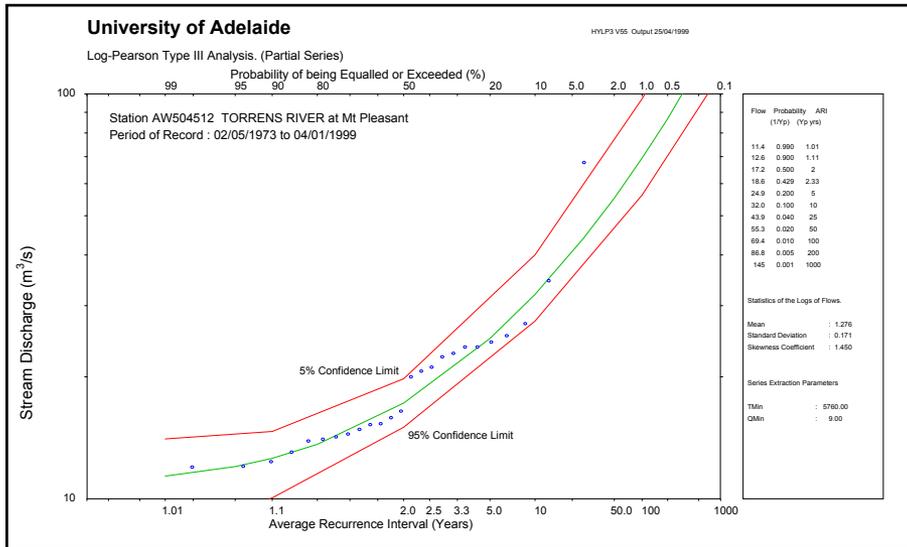
#### 4.6. Annual Maximum and Minimum Discharges

##### Torrens River at Mt Pleasant [25.9 km<sup>2</sup>]

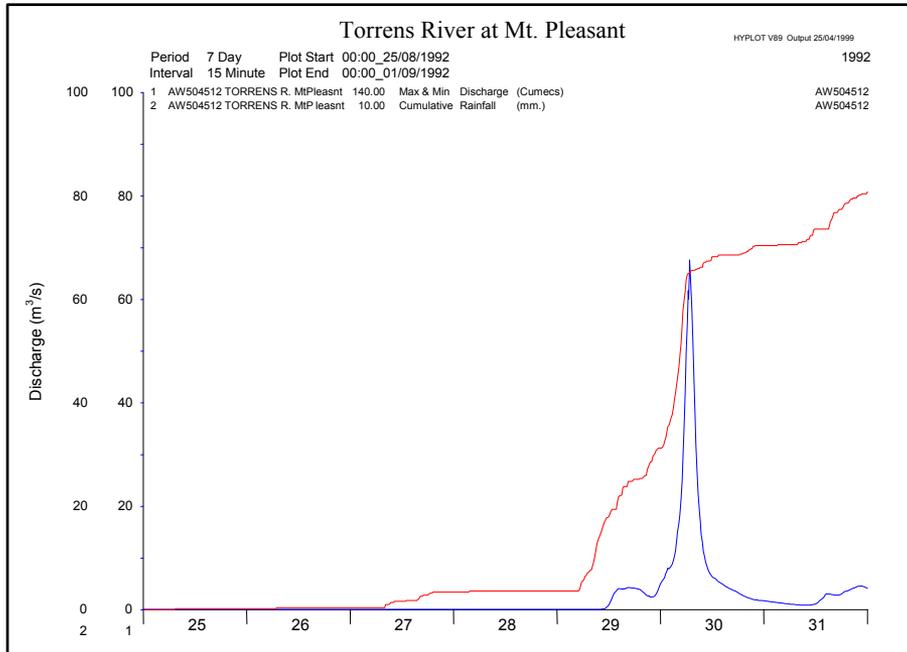
Year	Maximum <sup>1)</sup>		Minimum <sup>2)</sup>		Year	Maximum <sup>1)</sup>		Minimum <sup>2)</sup>	
	Date	[m <sup>3</sup> /s]	Month	[m <sup>3</sup> /s]		Date	[m <sup>3</sup> /s]	Month	[m <sup>3</sup> /s]
1973	1/9	19.99	5, 12	0.0	1987	15/7	9.212	many	0.0
1974	4/10	25.25	1, 3	0.0	1988	6/7	15.3	many	0.0
1975	23/10	21.12	1-5, 12	0.0	1989	31/7	12.34	many	0.0
1976	17/10	0.095	many	0.0	1990	15/8	4.356	many	0.0
1977	15/1	0.24	many	0.0	1991	18/9	9.01	many	0.0
1978	5/7	9.279	many	0.0	1992	30/8	67.64	many	0.0
1979	12/10	8.365	1-7, 12	0.0	1993	19/9	1.494	many	0.0
1980	12/10	4.929	1-4, 12	0.0	1994	24/6	0.410	many	0.0
1981	14/8	24.36	1-5,11,12	0.0	1995	22/7	34.54	many	0.0
1982	15/6	0.036	many	0.0	1996	30/9	20.64	many	0.0
1983	8/9	22.84	many	0.0	1997	31/10	0.596	many	0.0
1984	24/8	6.833	many	0.0	1998	28/7	3.184	many	0.0
1985	13/9	2.059	many	0.0					0.0
1986	12/9	4.074	many	0.0					0.0

1), 2) Instantaneous observation by recording chart

### Flood Frequency Distribution



### 4.7. Hyetographs and Hydrographs of Major Floods

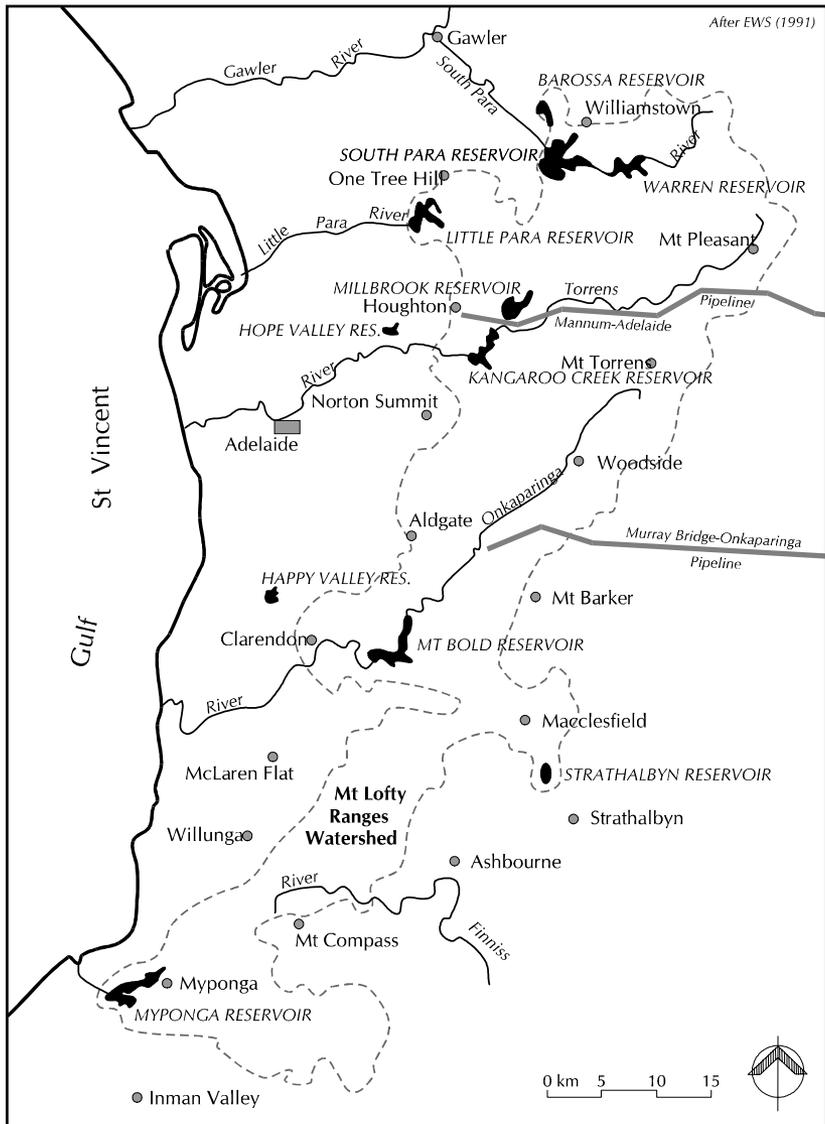


## **5. Water Resources**

### **5.1. General Description**

More than any other factor the scarcity of water resources has limited the development in South Australia. Approximately 83 % of the State receives less than 250 mm annual rainfall. Only 3.3 percent of the State receives an annual rainfall of over 500 mm. On an overall basis, there are limited water resources in South Australia. It is estimated that major ground and surface water resources have the potential to provide approximately  $3\,500 \times 10^6 \text{ m}^3/\text{year}$  of which  $3\,000 \times 10^6 \text{ m}^3/\text{year}$  is termed fresh and marginal water (water 0~1 500 mg/l TDS) (E&WS, 1989). The scarcity of water resources has made it necessary to develop water that would be considered to be marginal elsewhere and to pump water over long distances. South Australia is very dependent on the River Murray which originates outside the state. In an average season this river supplies over 50 % of South Australia's urban water consumption and in a dry year this can be as high as 90 %. The largest factor affecting the present and possibly future water supplies is water quality and significant catchment management programmes have been implemented to halt degradation and improve the quality of runoff. In the Mount Lofty Ranges the quality of runoff water entering local reservoirs is being addressed. In the selection of the site of the city of Adelaide an adequate water supply was sought. This was achieved using the Torrens and Onkaparinga Rivers.

## 5.2. Map of Water Resources Systems



## 5.3. List of Major Water Resources Facilities

The water resource facilities listed here are those that are in the catchment below Mt Pleasant and are used for water supply for Adelaide. The Torrens System comprises three reservoirs and the Mannum-Adelaide Pipeline. A fourth storage, Thorndon Park, which is the State's oldest Reservoir was taken out of service in 1978. Hope Valley Reservoir is fed by an aqueduct from the Gorge Weir which has an upstream catchment area of 343 km<sup>2</sup>. Kangaroo Creek Dam is a rock fill Dam. Its capacity was reduced in 1984 by spillway modifications that were part of the River Torrens Flood Mitigation Program. A proportion of the water in these reservoirs is from the River Murray, released into the Torrens River from the Mannum-Adelaide Pipeline at a number of points along its route.

## Major Reservoirs

Name of river	Name of dam (reservoir)	Catchment area [km <sup>2</sup> ]	Gross capacity [10 <sup>6</sup> m <sup>3</sup> ]	Purpose <sup>1)</sup>	Year of completion
	<b>Hope Valley Dam</b>	Off stream Storage	3.47	W	1872
<b>Torrens River</b>	<b>Kangaroo Creek Dam</b>	280	24.4 19.0	W	1969 mid 1984
	<b>Thorndon Park</b>	Off Stream Storage	.64	R	1860
	<b>Millbrook Reservoir</b>	Off stream storage	16.5	W	1918

1) W: Municipal water supply  
R: Reservoir

## 6. Socio-cultural Characteristics

The climate of the Mt Lofty Ranges was conducive to being populated by early settlers. It had the highest annual rainfall area within the state. Settlement of other country regions was confined to places that had small streams, soaks or springs augmented by small earthen dams and wells. South Australia's development has been characterized by the development of pipelines from the River Murray. The River Murray provides a source of water for domestic, industry and agricultural pursuits along its banks. It is also the main source of water for Adelaide and many towns far distant from the river including Whyalla, Woomera and Keith. Serious consideration for augmenting Adelaide's water supply includes utilising local runoff, rainwater tanks, urban stormwater runoff in conjunction with aquifer storage and recovery, and treated effluent.

## 7. References, Databooks and Bibliography

- Bureau of Meteorology (1988): *Climatic Atlas of Australia*, AGPS, Canberra, April 1988, 70 pp.
- Department of Environment Heritage and Aboriginal Affairs (1999): *5<sup>th</sup> Central Regional Network-Water Resources Project* (unpublished Report).
- Department of Primary Industries and Energy (1987): *1985 Review of Australia's Water Resources and Water Use*, Volumes 1 and 2, AGPS, Canberra, November 1987, 114 pp.
- Department of Resources and Energy (1983): *Water 2000: Consultants Report No. 7, Water Quality Issues*, AGPS, Canberra, 310 pp.
- Department of Resources and Energy (1983): *Water 2000: Consultants Report No. 9, In-stream and Environmental Issues*, AGPS, Canberra, 374 pp.
- Department of Resources and Energy (1983): *Water 2000: Consultants Report No. 12, Water Demand and Availability with reference to Particular Regions*, AGPS, Canberra, 321 pp.
- Engineering and Water Supply Department (1988): *Development of South Australia's Water Resources*, Information Bulletin No.11, April 1988.
- Engineering and Water Supply Department (1989): *Water South Australia, Managing the Resource into the next Century*, 23pp.
- Engineering and Water Supply Department (1992): *Adelaide's Water Supply Summary of the System*, Information Bulletin No.7, August 1992.