

**PROCLAMATION OF THE
MOORABOOL (SHEOAKS)
WATER SUPPLY CATCHMENT**

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SOIL CONSERVATION AUTHORITY
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CONTENTS

INTRODUCTION	3
WATER SUPPLY SYSTEM.....	3
WATER QUALITY TREATMENT	4
CATCHMENT DESCRIPTION.....	4
(a) General.....	4
(b) Geology.....	4
(c) Physiography.....	6
(d) Climate.....	6
(e) Soils and Vegetation	6
LAND USE.....	6
HAZARDS TO THE WATER SUPPLY	7
LAND CONSERVATION COUNCIL RECOMMENDATIONS	7
RECOMMENDATIONS.....	8

LIST OF TABLES

Table 1 - Geelong Water Supply Systems - Water Quality.....	5
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INTRODUCTION

In the early 1960's the Geelong Waterworks and Sewerage Trust requested that the catchments to Korweinguboora and Bostock Reservoirs be proclaimed as water supply catchments. The predecessor of the Land Conservation Council, the Land Utilization Advisory Council considered the Authority's reports on proclamation in 1961 and 1962 and recommended to the Governor-in-Council that these catchments should not be proclaimed. The reasons given for recommending against proclamation were the existence of the open channel from the two reservoirs to the Stony Creek Reservoirs which crosses a large area of freehold grazing land, and the catchment was also considered to be fairly stable.

The Land Conservation Council has adopted a different policy to its predecessor. In the final Recommendations for the Melbourne Study Area the catchments of Korweinguboora and Bostock Reservoirs and the Moorabool River Diversion to Bannockburn, are recommended for proclamation and subsequent Land Use Determination.

The land in this area is under increasing pressure for development, particularly for moderate to high density residential issues.

The Geelong Waterworks and Sewerage Trust has now requested that the Land Conservation Council and the Soil Conservation Authority recommend proclamation and land use determine the catchment of the Moorabool River to their offtake at Sheoaks. This area would include the catchments to Korweinguboora and Bostock Reservoirs and the Moorabool River Diversion to Bannockburn but not the catchments to Lal Lal Reservoir and the Stony Creek Reservoirs which are being dealt with separately.

This report presents some preliminary information to enable proclamation of the catchment under Section 5 (1) (b) of the Land Conservation Act 1970. Investigations have already commenced in the catchment for a land use determination, and a report for this determination will be submitted to the Land Conservation Council for consultation later this year.

WATER SUPPLY SYSTEM

The Geelong Waterworks and Sewerage Trust is authorised under its Act to supply water to all the area which lies within an 8 km radius of the Geelong Post Office. Water is collected from both the Moorabool and Barwon Rivers. There are two supply systems to Geelong from the Moorabool River.

The Eastern Moorabool system consists of 2100 ML Korweinguboora Dam on the Eastern Moorabool; the Bolwarrah Weir (6.4 Km downstream of the dam) which diverts water into the Ballan Channel; Bostock Reservoir (6600 ML) constructed across the Eastern Moorabool below its junction with Paddock Creek; and the Stony Creek Reservoirs. The Ballan Channel is capable of transmitting 55 ML of water per day into the storages at Stony Creek. A 9 Km aqueduct connects the Bostock Reservoir to the rest of the East Moorabool system.

The main storages in the Eastern Moorabool system are the Stony Creek Reservoirs which have a total capacity of 10 000 ML. There are four reservoirs; three at Upper Stony Creek and one at Lower Stony Creek. Upper Stony Creek No. 1 Reservoir was formed in 1870 by constructing an earthen bank across Stony Creek. This embankment is 380 m long and 26 m high and impounds 3400 ML. Reservoirs No. 2 and 3 were formed west of the main road by construction banks around natural depressions. They contain 2300 ML and 3600 ML respectively when filled to a depth of 6 m.

The concrete dam at Lower Stony Creek was constructed in 1872 and when filled to a height of 13 m, stores 640 ML.

Water from Upper Stony Creek runs through an open brick lined aqueduct, 10.5 km long, to the Anakie Pipe Head Basin. From there it is piped to Geelong (24 km away) in two mains 350 mm diameter and 375 mm diameter. There is very limited detention in Service Basins at Lovely Banks.

Water from the Lower Stony Creek Reservoir is piped through Anakie Gorge in a 375 mm diameter main and joins the outlet pipes from Anakie Pipe Head Basin, downstream from the Basin.

A separate report for the Proclamation and Land Use Determination of the catchment to the Stony Creek Reservoirs was submitted to the Land Conservation Council in March 1978.

In addition to the storages on the Eastern Moorabool, Geelong is supplied with water from the Lal Lal Reservoir (60 000 ML) on the Western Moorabool near Lal Lal (refer to report for a proposed Land Use Determination for the Lal Lal Water Supply Catchment, King 1977). Water is released from this dam and flows down the river to Sheoaks, where it is pumped from a weir into the Geelong System, via a 675 mm diameter steel main to a storage reservoir at Montpellier. A new pump is to be installed at Sheoaks capable of pumping 54 ML per da. The Bannockburn Waterworks Trust diverts water from the Moorabool River upstream of the Sheoaks diversion to supply people in Lethbridge, Meredith, Bannockburn, Inverleigh, Shelford and Teesdale.

WATER QUALITY TREATMENT

The Geelong Waterworks and Sewerage Trust monitors water quality at Korweinguboorra Reservoir, Bostock Reservoir, Stony Creek Reservoirs and the Moorabool River at Sheoaks. The main water quality problems are found at Sheoaks where water released from Lal Lal Reservoir into the Moorabool River undergoes significant deterioration in water quality. Currently the Trust is experimenting with various flow regimes from the Lal Lal Reservoir to keep salinity levels below 200 ppm. Colour and total iron are also problem parameters throughout the whole Moorabool system and are often above the recommended limits for domestic water supply. *E. coli* levels indicate significant faecal contamination in the Moorabool River at Sheoaks, but the levels are generally low throughout the rest of the system. Water passing through Stony Creek is not disinfected, but water from the offtake at Sheoaks is mixed with pre-chlorinated water in the service basin and perhaps the residual chlorine assists in reducing *E. coli* levels. The Trust maintains that *E. coli* levels in the distribution system are consistently low enough not to warrant chlorination at this time. A pipeline has been considered to take water from Bungal Dam to Sheoaks, but is considered to be too expensive (approximately \$6 million). However, if the pipeline was constructed, the proclaimed catchment would probably need amendment.

Table 1 shows the water quality data for the Moorabool supply system.

CATCHMENT DESCRIPTION

(a) General

The catchment area to the offtake weir at Sheoaks is approximately 460 km² and runs from the Great Dividing Range to within 25 km of Geelong. The catchment is approximately 50 km long and 10 km wide and runs North-South.

The catchment contains the towns of Korweinguboorra, Elaine, Barkstead, Gordon and Mt Egerton. It is mainly within the Shires of Bannockburn and Ballan, covering the Parishes of Korweinguboorra (Pt.), Moorabool West, Gorong (Pt.), Yaloak (Pt.), Moreep (Pt.), Coolebarghurk (Pt.), Durdidwarrah (Pt.), Bungal, Bungeeltap (Pt.), Ballark (Pt.), Meredith (Pt.), Lal Lal (Pt.) and Borheneyghurk (Pt.)

(b) Geology

In the North part of the catchment, the predominant rock types are Ordovician sandstone, mudstones and siltstones, with a couple of volcanic flows down old river beds. Twin stream development can be seen along these southerly moving flows.

The central part of the catchment and along the Eastern edge are predominated by Quaternary basalt flows from some half dozen volcanic cones.

Table 1 - Geelong Water Supply Systems - Water Quality

RANGE OF VALUES OVER 1975/76

INDICATOR OR PARAMETER		WATER AT SOURCE					WATER SUPPLIED TO CONSUMERS		
		Korweinguboora	Bostock	Stony Creek	Concrete dam	Moorabool River She-oaks	ex Highton S. Basin	ex Montpellier S. Basin	ex Lovely Banks S. Basin
T.D.S. as NaCl mg/l	Av. mg/l	58	142	119	140	238	83	121	124
	L	37	100	105	110	86	67	77	81
	H	140	210	150	180	530	95	210	160
	Samp. Freq.	M	M	M	M	D	M	M	M
Turbidity F.T.U.	Av.	8.7	5.8	3.8	5.1	7.7	9.2	8.4	6.5
	L	1.9	1.4	1.6	1.8	0.6	4.0	2.6	3.2
	H	37	13	10	23	340	17	24	12
	Samp. Freq.	M	M	M	M	D	M	M	M
Total Hdness as CaCO ₃ mg/l	Av.	26	54	49	55		34	54	54
	L	12	39	38	40		29	31	36
	H	64	75	70	70		50	88	85
	Samp. Freq.	M	M	M	M		M	M	M
Chloride as Cl mg/l	Av.	32	70	60	71		35	51	60
	L	17	46	51	54		30	30	39
	H	70	109	72	85		42	88	91
	Samp. Freq.	M	M	M	M		M	M	M
Sulphate as SO ₄ mg/l	Av.						5	5	3
	L						1	1	1
	H						10	11	6
	Samp. Freq.						X	X	X
Total Iron as Fe mg/l	Av.	1.76	1.27	1.07	1.41		1.27	1.28	1.33
	L	0.46	0.61	0.58	0.84		0.56	0.47	0.76
	H	7.01	2.06	1.65	2.02		2.06	3.00	2.03
	Samp. Freq.	M	M	M	M		M	M	M
pH Units	Av.	7.15	7.12	7.04	7.01		7.18	7.38	7.19
	L	6.4	6.5	6.4	6.6		6.2	6.7	6.6
	H	8.0	7.6	7.6	7.6		8.4	8.7	8.3
	Samp. Freq.	M	M	M	M		M	M	M
Colour Pt-Co Units	Av.	67	64	42	68	41	32	29	42
	L	45	40	10	25	15	15	10	15
	H	100	150	65	170	210	55	60	85
	Samp. Freq.	M	M	M	M	D	M	M	M
E. Coli (Membrane) Orgs/100 mls	Av.			2.1		30	0.2	0.3	0.2
	L			0		0	0	0	0
	H			59		890	5	14	3
	Samp. Freq.			T		W	T	T	T

Sampling Frequency: M = Monthly, W = Weekly, T = Twice weekly, D = Daily, X = Occasional

Water Quality Criteria adopted by W.H.O. and Australian Cities and Recommended Derived Working Levels by B.T. Hart (Compilation of Australian Water Quality Criteria)

	T.D.S.	Turbidity	Total Hardness	Chloride	Sulphate	Total Iron	pH	Colour	E. Coli MPN Coliforms per 100 ml.
W.H.O.	1500 p.p.m	25 p.p.m	125 p.p.m	600 p.p.m	400 p.p.m	1.0 p.p.m	6.5-9.2	50 p.p.m	90% < 10 100% < 20
Australian Cities	1500 p.p.m	25 p.p.m	125 p.p.m	250 p.p.m	250 p.p.m	1.0 p.p.m	6.5-9.2	50 p.p.m	90% < 10 100% < 20
B.T. Hart	-	< 25 J.T.U	500 mg/l	200-600 mg/l	< 250 mg.l	0.3 mg/l (dissolved)	6.5-9.0	15 mg/l	3 satisfactory 3-10 suspicious > 10 unsatisfactory

Tertiary sands and gravels are the main feature in the South of the catchment, but also occur in the centre and along the western boundary.

The Muckleford Fault runs along the Western boundary, almost due North-South.

(c) *Physiography*

The Great Dividing Range in the North part of the catchment reaches elevations of over 800 metres above sea level, and the area to the north of the Western Highway is dominated by the foothills below the Range. South of the Highway, there is mainly a basalt plain at about 500 m elevation, often with twin stream development deeply dissecting the underlying Ordovician or Tertiary sediments.

In the south part of the catchment there is deeper dissection due to the Moorabool River and elevation generally drops to about 300 m. Steep escarpments and slopes down to the streams form the most fragile part of the catchment.

(d) *Climate*

Rainfall varies from 1000 mm in the North to 600 mm in the South. Average summer rainfall varies from 140 mm to 105 mm, and average winter rainfall varies from 300 mm to 150 mm. At Ballan the average daily maximum temperature is 16.0°C, the average daily minimum temperature is 6.4°C, and the average daily temperature is 11.7°C. At Durdidwarrah the average daily maximum temperature is 7.7°C, and the average daily temperature is 12.3°C. The temperatures on the Great Dividing Range are probably on average 1 - 2°C colder than at Ballan.

Average annual evaporation would be approximately 1100 mm. Winds are predominantly from the West and North-West, and are generally less than 10 knots. Mean daily velocities in excess of 20 knots have been recorded in the area on several occasions.

(e) *Soils and Vegetation*

The soils and vegetation are similar to those described for the adjacent Lal Lal catchment (King, 1977). The exception being that there is no Devonian granitic parent material in the East Moorabool catchment.

Consequently, both grey duplex and red gradational soils are found on the basalt material, gradational red and yellow soil are found on Tertiary sands and gravels. Smaller areas of soils derived from Permian parent material and alluvium will be described in the Land Use Determination report.

Detailed descriptions of the vegetation will be included in the Land Use Determination Report, It is sufficient to note here that most of the original vegetation has been removed from the basalt plains, but not from the Ordovician sediments or Tertiary deposits. Recent large scale clearing of the mixed species forest on the Northern Ordovician sediments has taken place for softwood conversion.

LAND USE

Most of the Northern part of the catchment is Reserved Forest, particularly on the Ordovician sediments. The basalt plains are mainly in freehold ownership and are used for cattle grazing and potato cropping in the north and sheep and cattle grazing south of the Western Highway. Parts of the Tertiary deposits in the South have been cleared and are used for grazing, but significant areas remain forested.

Due to the close proximity of the catchment to Melbourne, there is increasing pressure for small farmlet development and some of the small villages are seeing some renewed vigour. "Hobby" farming is increasing, particularly around Mt Doran, Steiglitz, and Sheoaks. Recreational development is increasing within the catchment and has caused some concern to the Geelong Waterworks and Sewerage Trust.

HAZARDS TO THE WATER SUPPLY

The erosion hazard in the catchment is fairly low, but areas of steep Ordovician sediments, basalt escarpments, and steeper Tertiary derived soils should be protected from intensive development. Similarly, alluvial soils and flood plains are generally not suitable for housing development. A Land Use Determination for this catchment will probably concentrate on these areas of significant hazard to the water supply. Over-clearing has led to increasing salinity within the catchment and forest management (particularly softwood conversion) needs to be more strictly controlled.

LAND CONSERVATION COUNCIL RECOMMENDATIONS

The final recommendations for the Melbourne Study Area state "that all domestic water supply catchments within the study area should be investigated by the Soil Conservation Authority and, where appropriate, recommended for proclamation by the Land Conservation Council, in order to ensure a uniform procedure for land use planning within these areas".

The report states further "that in the case of the locations listed below and shown on the maps (all these locations being within catchments for which no land use determinations have been made) the present tenure and management of public land continue for the time being and that once a land use determination has been made, the following areas:

- (i) the storage works
- (ii) diversion works
- (iii) associated facilities
- (iv) the buffer strips around diversion works and storages, as defined in the land-use determination
- (v) any other allotments as specified below.

be used for

- (a) water supply purposes
- (b) other activities permitted by the water supply authority after consultation with the Soil Conservation Authority and the Environment Protection Authority.

and that these areas be permanently reserved under section 14 of the *Land Act* 1958 for water supply purposes, and be managed by the water supply authority named.

Note: (i) The buffer should be wide enough to prevent direct pollution, to filter overland flow of water, and to control access. Its width will vary to suit differences in ground slope, soil type, vegetative cover, adjoining land use, and type of facilities available for treating the water".

D50 Moorabool River Diversion - Bannockburn Waterworks Trust

D52 Bostock Reservoir, Geelong Waterworks and Sewerage Trust; the reserve to include the following: Parish of Moorabool West, east of allotment 8A, east and south of allotment 4A of section 1.

D53 Korweinguboora Reservoir, Geelong Waterworks and Sewerage Trust.

The area recommended for proclamation includes the catchment to the Bannockburn Diversion, Bostock Reservoir, and Korweinguboora Reservoir and extends the area slightly to include the catchment to the Geelong Waterworks and Sewerage Trust offtake at Sheoaks.

RECOMMENDATIONS

1. That the Authority approve that this report be forwarded to the Land Conservation Council to enable it to take appropriate action for proclamation of the Moorabool (Sheoaks) Water Supply Catchment.
2. That the Land Conservation Council recommend to the Governor-in-Council that the catchment be proclaimed as per Plan 1 under section 5(1)(b) of the *Land Conservation Act*, 1970.
3. That the Authority commence investigation of the catchment for a Land Use Determination under Section 23(1) of the *Soil Conservation and Land Utilisation Act*, 1958.

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