A REPORT ON THE BEALIBA WATER SUPPLY CATCHMENTS

A PROPOSAL FOR PROCLAMATION PREPARED FOR CONSIDERATION BY THE LAND CONSERVATION COUNCIL

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Contents

Introduction

Bealiba, a township in north-central Victoria, obtains water for domestic supply from Bealiba Reservoir, a catchment storage within the locality.

A second storage, the Railway Dam, fed from a separate but adjacent catchment, meets the requirements of the railway works camps, the watering needs of public reserves, and in emergencies is used for augmenting the town's domestic supply.

Both storages are administered by the Bealiba Waterworks Trust.

Drought conditions severely affect the water supply, so much so that occasionally an alternative source must be found to supplement or temporarily replace the main domestic supply. Several times the Railway Dam has performed this role but during the 1976/77 drought both storages emptied and water was transported to the town by rail from Maryborough. Following the failure of the town's water supply reserves, approval was given to a scheme for pumping water from the Avoca River to the Bealiba Reservoir to overcome the shortfall in catchment runoff during drought conditions. Installation of that scheme was completed in the autumn of 1980. It is anticipated that during drought periods, the Avoca River Scheme will reduce the reliance previously placed upon the Railway Dam for augmenting the town's needs. The Trust however sees a need to retain the Dam as an integral part of the emergency supply system.

The Bealiba Waterworks Trust has repeatedly expressed concern at erosion occurring within the catchment and the effect this has on water quality and siltation of the Reservoir. Discussions and inspections with the Trust have been held and it is now generally agreed that proclamation would be beneficial by promoting an increased awareness of the need for land use management planning in the catchments.

The water catchments are part of a large project (Appendix A) where planning for improved land stability, using erosion control and conservation management techniques, has been carried out by the Soil Conservation Authority. Declaration of the project as the Bealiba-Black Range Group Conservation Area was made in 1978 thereby providing the means for the systematic implementation of the above measures, as and when finance (both public and private) becomes available. Methods and measures proposed for improving the condition of land and the means of implementation within the project area are contained in a separate report[1].

Final recommendations have been published by the Land Conservation Council for the North Central Study Area covering the water catchments. With reference to water production, the Council has reiterated its policy that, the Soil Conservation Authority should investigate all domestic water supply by the Council in order to ensure a uniform procedure for land use planning within the area.

Information obtained from a preliminary investigation of the catchments is contained in this proclamation report prepared for consideration by the Land Conservation Council. It is recommended that the Bealiba Water Supply Catchment be proclaimed under the provision of the *Soil Conservation and Land Utilization Act* 1958 and the *Land Conservation Act* 1970.

[1] Bealiba-Black Range Group Conservation Area – Planning Project, Soil Conservation Authority, Nov. 1977

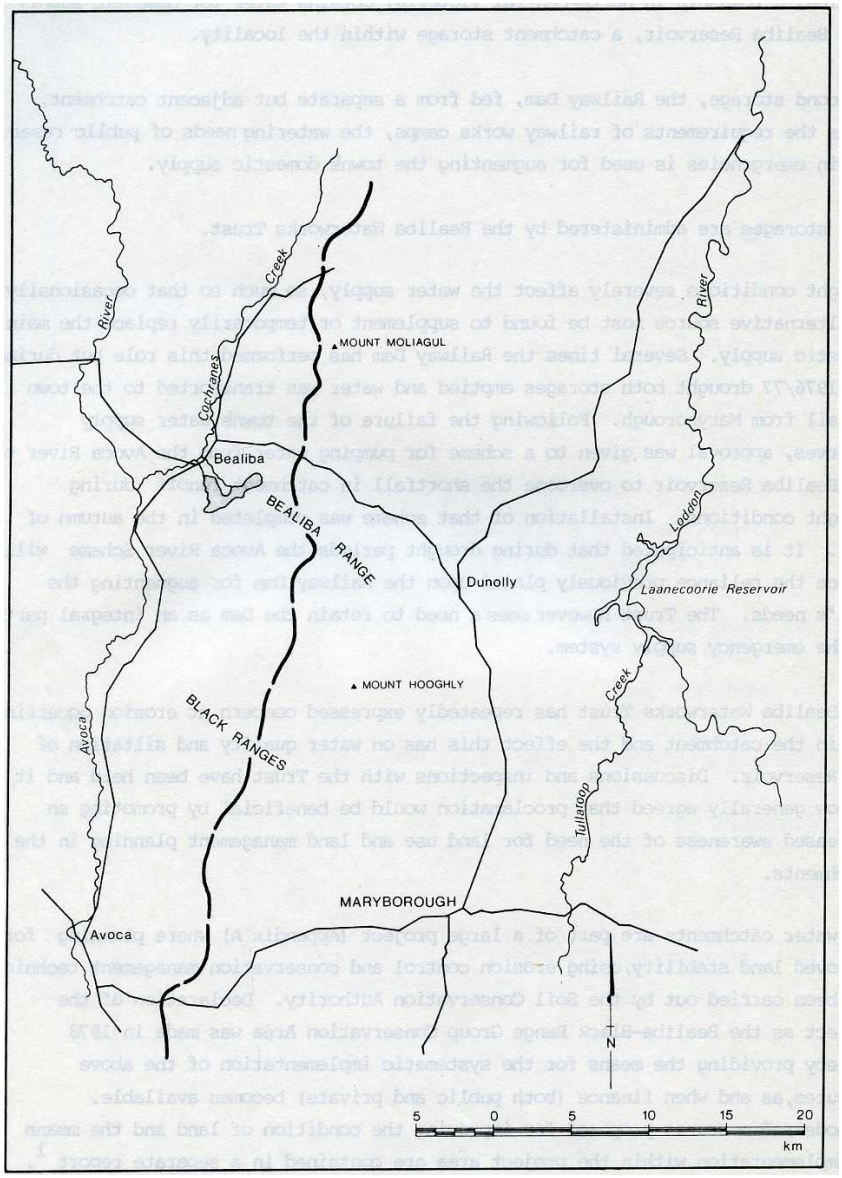


Figure 1 – Locality plan

Locality

The Avoca River Basin contains the Bealiba Water Supply catchments which drain to the lower reaches of Cochranes Creek, some 4 km east of the Avoca River. The catchments lie partly on the slopes of the Bealiba Range, several kilometers south-east of the township and about 35 km north-west of Maryborough. (Refer to locality plan – Fig 1).
Catchment areas are: 425 ha to Bealiba Reservoir and 135 ha to the Railway Dam.

The functions of the Statutory planning and Local Government are the responsibility of the Shire of Bet Bet. Land falls within the parishes of Archdale and Bealiba with a minor portion in the Township of Bealiba, all part of the Country of Gladstone.

Water Supply

Supply Systems

A natural catchment of approximately 145 ha plus 280 ha of neighbouring catchments, by way of a channel system, drain to Bealiba Reservoir. Storage capacity is about 150 ML. The Reservoir by means of the diversion channel from the west also receives water pumped via a

rising main from the Avoca River, an alternative source during periods of low reserves. From the reservoir water is gravitated 2.5 km to the township's reticulation system.

The Railway Dam, with a storage capacity of 18.6 ML, drains a net area of some 135 ha, resulting from part of the natural catchment being diverted to the Bealiba Reservoir. From the dam, water is pumped to an elevated storage for distribution to a separate system or, if required, into the township's reticulation system.

Diversion system – Based on catchment area, two-thirds of the water reaching Bealiba Reservoir comes from neighbouring catchments (refer to Fig 4). Graded banks (diversion channels) intercept and convey runoff from these catchments to the reservoir catchment. From the points where the banks discharge, water reaches the reservoir by the natural drainage systems; consequently, flow in these lines is significantly greater than normal.

This has produced localized but some extensive sheet and gully erosion within the water supply reserve where gullies 2-3 m deep are present. Rock bars have in some instances stabilized this downward progress, but other erosion is still relatively active.

Measures for erosion control together with alternatives for relocating or extending the diversion channels are presently being evaluated by the Soil Conservation Authority as detailed planning for the GCA progresses.

Water Quality

Due to the poor condition of catchment land, sediment and colloid in significant amounts are mobilized during periods of runoff. Along with the clay colloid, much of the sediment reaches the storages resulting in problems of sedimentation and turbidity.

Apart from several water samples analysed in 1974, water quality is subjectively assessed on turbidity, which is considered the major problem, and estimated on most occasions to be above 100 units. Algal blooms occur from time to time suggesting raised nutrient levels, and by inference high *E. coli* may be present, as the most likely source of nutrient appears to come from animal wastes in runoff.

Salinity within the Bealiba Reservoir, which normally does not exceed 200 ppm, may be subject to periodic increases when water from the Avoca River is called upon. Under these conditions clarity of the water may improve due to the saline component promoting flocculation of the clay colloid. Ideally water should only be pumped from the Avoca River during periods of high flow, to ensure that increases in salinity of the reservoir are minimal; however this period may not necessarily coincide with a need for augmenting reserves so that pumping at other times is envisaged.

On the basis of subjective assessment the quality of water is normally unsuitable for drinking; accordingly, the local community generally accepts that reticulated supply provides for most domestic needs other than for drinking. The situation in respect to sedimentation and water quality is not expected to change significantly until improvements in the present management of land are adopted and erosion control measures are improved throughout the catchments.

Features of the Catchment

Climate

Bealiba water catchments are situated in the Upper Northern climatic district of Victoria, a district with a comparatively high index of rainfall variability which can be identified with an unreliability of rainfall and drought occurrence close to the highest experienced in the state.

Annual average rainfall for Bealiba is 469 mm and this is distributed fairly evenly throughout the year particularly between May and October as indicated in Appendix B.

Temperature data for St Arnaud and Charlton is given in Appendix 1. Mean daily temperatures are highest in January and February and lowest in July. Although both stations are located some distance to the north-west of Bealiba, environmental factors influencing climate are present which suggest that condition across the catchments are intermediate between St Arnaud and Charlton.

On average, a growing season of 6-6½ months, from April to October, could be expected in the catchment.

Geology, Physiography and Topography

Basement rock throughout the Bealiba district consists of Lower Palaeozoic sediments, and accounts for about 90% of the catchment surface. Extensive intrusions of granitic/granodiorite into these sediments occurred during the Lower Devonian era resulting in contact metaphorism of the sedimentary material. Granite of the Natte Yallock pluton extends into the catchment from the south. The metamorphic aureole of resistant rocks surrounding this can be identified by the prominent contact ridge comprising the Bealiba Range and the associated ridge to the west coincident with part of the catchment boundary.

Physiographically, the catchments are situated within the Midlands, a geomorphic unit of the Western Highlands of Victoria. They are located on the westerly slopes of the Loddon/Avoca divide in a region of subdued relief derived from a variety of Lower Palaeozoic rocks and old erosion surfaces. Drainage lines are shallow, and quickly develop broad valleys short distances from their origins.

The locality about the catchments is dominated by the Bealiba Range. Lying on the southern catchment boundary, the Range provides a localized and abrupt contrast to the low hills and plains topography of the surrounding areas some 200-240 m lower. Highest point in the catchment – about 446 m – occurs where the boundary crosses the main ridge of the Range on its north-west extremity. The catchment contains the steep western slopes of the Range. These moderate as the lower slopes conform to the undulating character of the remaining land in the catchment.

Soil and Vegetation

Four land systems (refer to Figure 2) identified within the catchment, provide a suitable basis for the description of soils and vegetation that follows. Land System A is a section of the contact ridge, comprising the Bealiba Range and aureole of resistant rocks derived from Lower Palaeozoic sediments.

Soils are typically shallow and stony, varying from stony loams on the upper slopes to stony red gradational types on lower slopes. Although soil permeability is moderate to high, water holding capacity is low and structure is poorly developed.

Few examples remain of the original native species comprising grey box, red box and long leaf box. Principal vegetation now is native grasses.

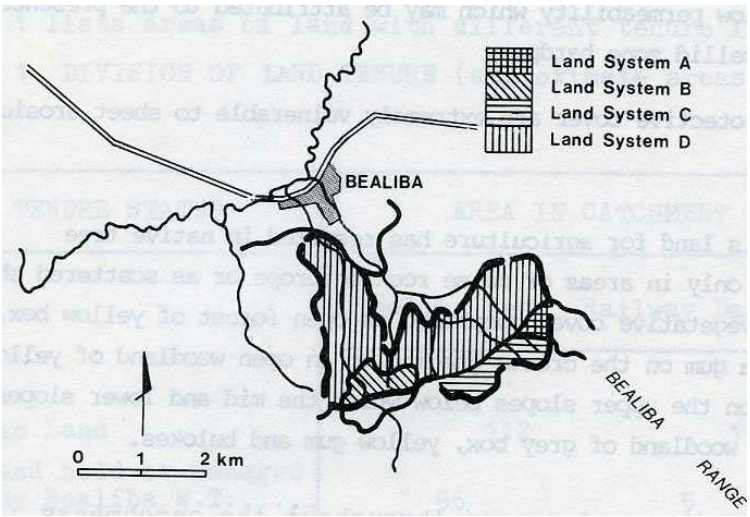


Figure 2 – Land Systems

The land has a low capacity for providing other than a seasonal protective cover of pasture species – conditions which give rise to the occurrence of a high risk of sheet erosion.
Land system B – consists of exposures of the aureole ridge of resistant rocks derived from metamorphosed Lower Palaeozoic sediments.

Soil similar to those described above (land system A) have also developed on land system B. Significant differences are: an apparent decrease in the coarser fractions throughout the profile, but particularly in the surface horizons, and slightly reduced soil permeability.

As a result of agricultural development few native tree species remain. Differences in the original native vegetation between the two land systems A & B suggest that slightly better moisture status exists on the latter, where red stringybark has lost its dominance to grey box, and yellow gum is co-dominant and lower slopes with grey box.

Land system C is represented in the catchment by the resistant granite ridge of the Bealiba Range together with the lower crests and slopes.

Granite tors are present on the ridge and steep slopes, interspersed with a shallow coarse sandy loam soil. As the slope moderates yellow brown duplex soils with coarse structure occur until the red duplex soils of the lower flatter slopes are reached.

These latter soils are characterized by surface horizons of hard setting sandy loams, and low permeability which may be attributed to the presence of an underlying pallid zone hardpan.

Soils lacking a protective cover are extremely vulnerable to sheet erosion by wind and water.

Development of this land for agriculture has resulted in native trees species remaining only in areas of dense rock outcrops or as scattered shade trees. Original vegetative cover comprised an open forest of yellow box, grey box and manna gum on the crests grading to an open woodland of yellow box and grey box on the upper slopes below which the mid and lower slopes supported an open woodland of grey box, yellow gum and bulokes.

Land system D is the most common throughout the catchments. The land comprises the low gentle ridges and moderately dissected plain developed on Lower Palaeozoic sediments.

Again shallow soils occupy the higher position in the landscape. On the sharp crests these tend to be stony red gradational types, with red sodic duplex types on gentler crests.

Deeper soils are present on the long straight slopes, having a coarsely structured red sodic duplex types, and about the shallow drainage lines where a yellow sodic duplex soil is found.

The gradational soils have a low natural fertility, and low water holding capacity. Duplex soils are hard setting, have high soluble salt content and on lower slopes have low permeability. These soil properties in combination with the moderately steep slopes of some land and the generally light texture and poor structure of the surface horizons create a high risk of erosion occurring following clearing or when surface cover is depleted. Extensive erosion is present in this land system.

A significant area of this land still remains under native vegetation with an open forest structure. Predominant Eucalypt species range from red stringybark, red box and red ironbark on the shallow soils of the crests, to yellow gum, grey box and yellow box on the deeper soils about drainage lines. Yellow gum and grey box occupy the long intermediate slopes with grey box and red ironbark predominant account for more than half the present vegetative cover.

Land tenure and land use

Table 1 lists areas of land with different tenure in the catchments.

Table 1 – Division of land tenure (approximate areas)

Tenure status	Area in catchment (ha)		
	Bealiba Res.	Railway Dam	Total
Public land	112	11	123
Land held or managed by Bealiba WT	96	5	101
Reserved forest	16	-	16
Other public land	-	6	6
Freehold land	313	124	437
	425	135	560

Only one-eighth of the total length of 3.3 Km of diversion channel that traverses freehold land is contained within an easement (refer to Fig 4).

Agricultural use of land predominates in the catchments. There are no residences in the area and present information indicates that there is unlikely to be any in the foreseeable future.

All public land is timbered. Multiple use is made of the area but the adverse effect of this on water production is considered to be minimal. In addition to hardwood production from reserved forest, the durable timbers of the water supply reserve are harvested from time to time. Tracks in the reserve include access to the adjacent freehold land. These are well defined and appear to be used regularly by the public. Access to the water's edge is unrestricted.

Most of the area in freehold tenure has been cleared for farming purposes. Some cropping has been carried out in the past but grazing is now the main activity; however, clovers and perennial grasses do not persist well because of soil and climatic limitations; consequently pastures revert to annual species. In this condition special management is required to maintain adequate ground cover throughout the year.

LCC Recommendations

Final recommendations for the North Central Study Area have been published by the Land Conservation Council. These apply to public land in the catchment as shown in Figure 3.

Condition of land and hazards to the water supply

There is little doubt that the major problem affecting the water supply is erosion within the catchments. This was initiated in the past during the early development of the land the water resources, and has continued with reduced activity since.

Gully erosion is the most active both on public and freehold land and is the major source of turbidity and sediment. Sheet and tunnel erosion are minor problems in this regard. Loss of vegetative cover through salting is also minor at present.

Treatment of these is necessary if water quality is to improve. Erosion control works and improved management techniques are treatment measure proposed for rehabilitation of catchment land. However, the extent that land management is required to change to effect a major improvement in catchment stability and quality of runoff, may be beyond the economic viability of many land holders to implement and maintain. There is a further matter to consider, that if improved catchment conditions do eventuate, it is possible that yield from runoff may decrease to the detriment of adequate supply. On the worst affected areas, the need to rehabilitate the land for both land and water conservation purposes is sufficiently great that Government purchase and subsequent management to promote regrowth may provide the best long term solution.

An alternative could be for landholders to undertake tree planting funded with grants made available by the Forests Commission under a recently announced “Tree Planting Assistance Schemes”.

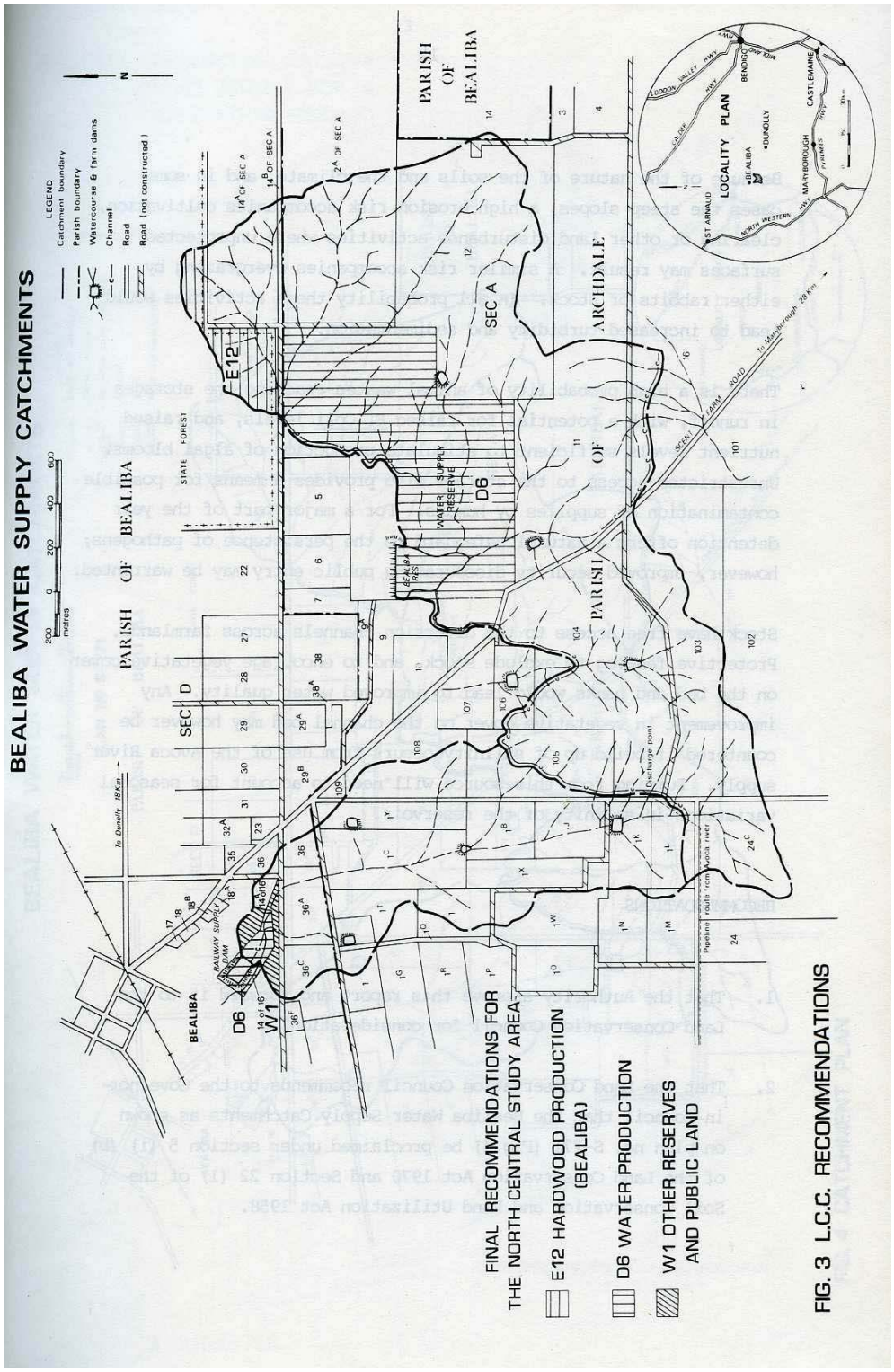


Figure 3 – LCC Recommendations

Because of the nature of the soils and the climate, and in some cases the steep slopes, a high erosion risk accompanies cultivation, clearing or other land disturbance activities where unprotected surfaces may result. A similar risk accompanies overgrazing by either rabbits or stock. In all probability these activities would lead to increased turbidity and sedimentation.

There is a high probability of animal wastes reaching the storages in runoff, with a potential for raised E. Coli levels, and raised nutrient levels sufficient to stimulate production of algal blooms. Unrestricted access to the storage also provides a means for possible contamination of supplies by humans. For a major part of the year detention offers a natural safeguard to the persistence of pathogens; however, improved security discouraging public entry may be warranted.

Stock have free access to the diversion channels across farmlands. Protective fencing to exclude stock, and to encourage vegetative cover on the bed and banks would lead to improved water quality. Any improvement in vegetative cover on the channel bed may however be countered if build up of salinity occurs from use of the Avoca River supply. Pumping from this source will need to account for seasonal variations in salinity of the reservoir.

Recommendations

1. That the Authority approve this report and forward it to the Land Conservation Council for consideration.
2. That the Land Conservation Council recommends to the Governor-in-Council that the Bealiba Water Supply Catchments as shown on Plan No. S-771 (Figure 4) be proclaimed under section 5 (i) (b) of the *Land Conservation Act* 1970 and Section 22 (1) of the *Soil Conservation and Land Utilization Act* 1958.

Figure 4 – Catchment plan

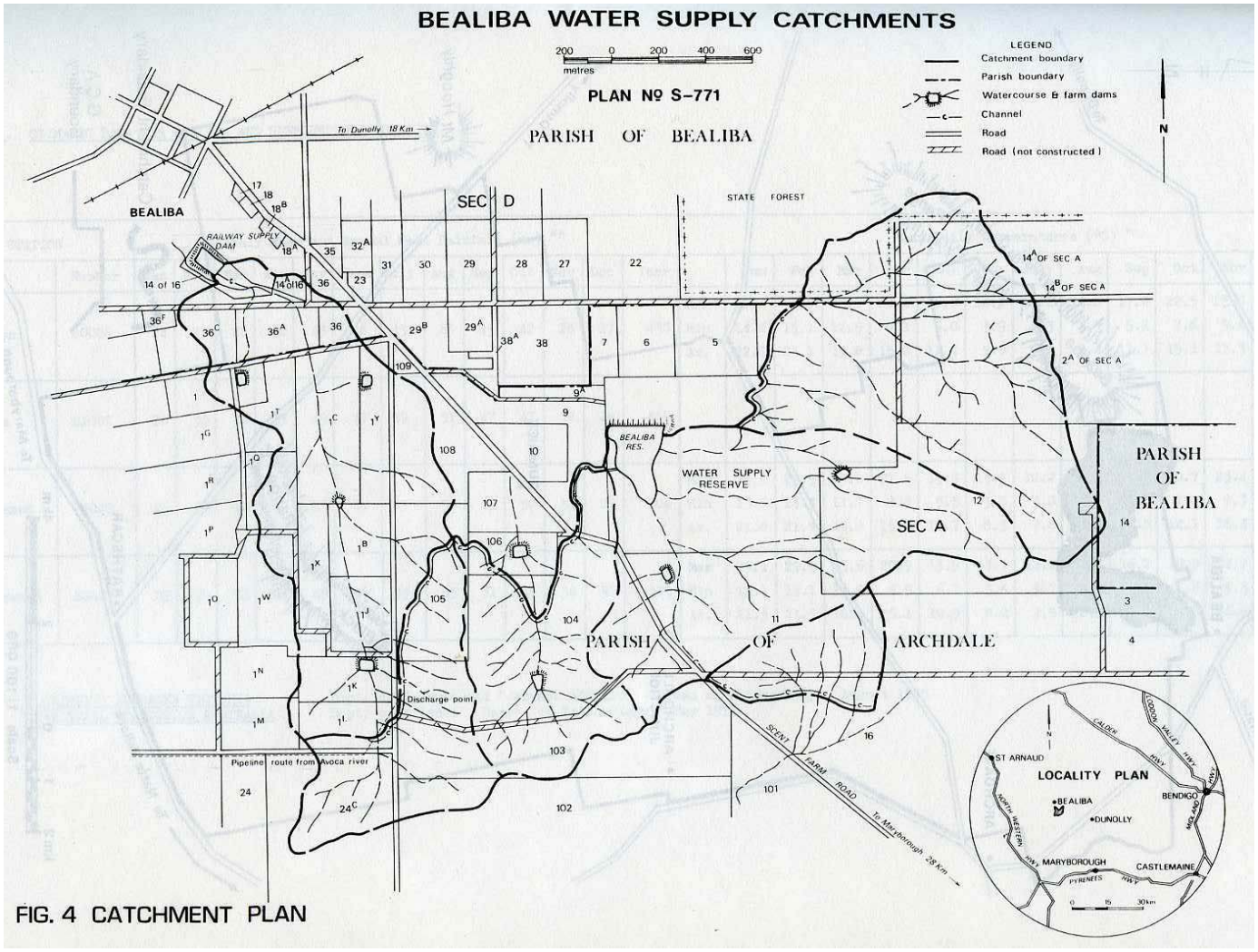
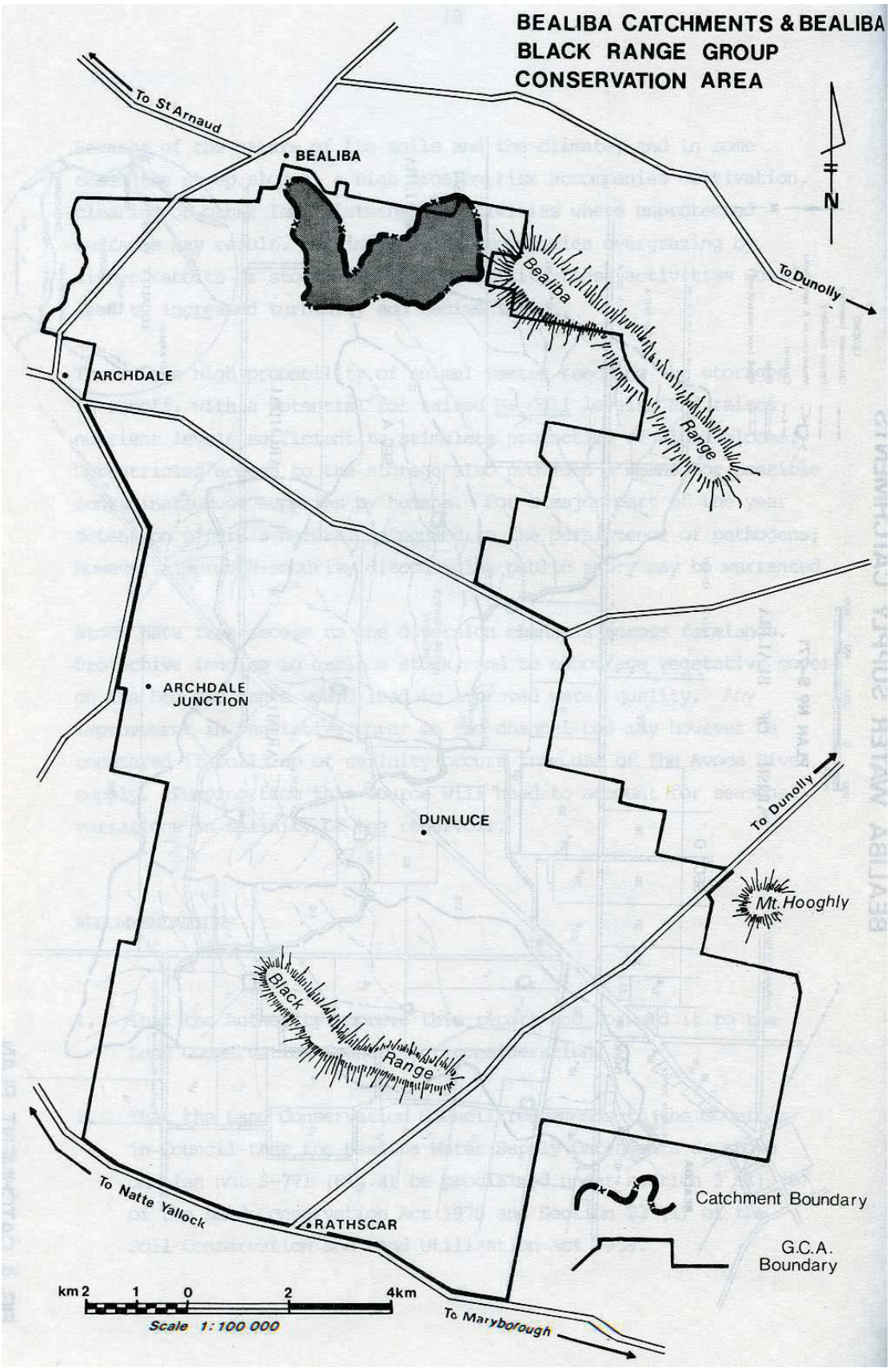


FIG. 4 CATCHMENT PLAN


BEALIBA CATCHMENTS & BEALIBA
BLACK RANGE GROUP
CONSERVATION AREA
To St Arnaud
BEALIBA
N
To Dunolly
Bealiba
Range
ARCHDALE
ARCHDALE
JUNCTION
DUNLUCE
To Dunolly
Mt. Hooghly
Black
Range
To Natte Yallock
RATHSCAR
Catchment Boundary
G.C.A.
Boundary
km 2 1 0 2 4km
Scale 1:100 000
To Maryborough

Appendix A

Table 2 – Climatic data for Bealiba and surrounding districts

Station																										
Name	Number	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Charlton	80006	24	27	28	32	43	48	43	45	43	42	28	27	430	Max	31.1	21.0	27.0	22.4	16.8	14.1	13.2	14.8	17.0	22.5	25.0	27.9	21.8
															Min	14.2	15.1	12.5	9.1	6.0	3.9	3.3	3.9	5.2	7.6	9.6	12.4	8.6
															Av	22.7	23.1	19.8	15.8	11.4	9.0	8.3	9.4	11.1	15.1	17.3	20.2	15.3
Bealiba	81002	26	30	30	33	49	47	49	51	47	47	32	58	469														
St Arnaud	79040	26	30	28	39	53	59	55	56	49	50	34	29	505	Max	29.9	29.5	25.8	21.6	15.9	13.1	12.2	13.8	16.2	20.7	23.4	26.3	20.7
															Min	13.6	14.3	11.7	8.8	5.5	3.5	3.0	3.9	5.4	7.4	9.3	11.3	8.1
															Av	21.8	21.9	18.8	15.2	10.7	8.3	7.6	8.9	10.8	14.1	16.4	18.8	14.4
Maryborough	88043	29	35	32	41	49	56	53	55	51	49	38	37	525	Max	29.1	9.0	25.6	20.9	15.9	13.1	12.2	13.7	16.2	19.9	22.7	26.1	20.4
															Min	13.1	14.1	11.8	8.9	6.1	3.6	3.1	4.0	5.5	7.6	9.3	11.4	8.2
															Av	21.36	21.5	18.2	15.1	10.9	8.2	7.5	8.8	10.8	13.9	16.1	18.5	14.

Sources * Climatic Averages Victoria — Dept. of Science and Consumer Affairs — Bureau of Meteorology — August 1975
** Rainfall Statistics Australia — Dept. of Science — Bureau of Meteorology — May 1977