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RESERVES IN THE NORTHERN JARRAH FOREST

STAGE 1 REPORT

RESERVES REVIEW COMMITTEE

July, 1984

CONTENTS PAGE

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STAGE 1 REPORT - RESERVES REVIEW COMMITTEE

1. INTRODUCTION AND PRINCIPAL RECOMMENDATIONS

1.1 INTRODUCTION

It is Government policy to create a series of conservation reserves in the Northern Jarrah Forest and the designation of a contiguous reserve centred on the Murray River Basin of area of the order of 49 000 hectares was announced as a first stage in this process in October, 1983.

The second stage of the procedure was to undertake the systematic review of other proposed reservations which had been recommended by the System 6 Study. In December of 1983 the Hon Premier and Minister for Forests requested that a Committee be formed to assess available technical data and recommend on reserve boundaries that will enable an optimum compromise between access to bauxite, timber and other resources on the one hand and retention of conservation and recreation values on the other.

Accordingly, the Reserves Review Committee has been formed and comprises members of the inter-departmental Mining and Management Programme Liaison Group augmented by representatives from Alcoa, the Conservation Movement, timber industry and an independent scientist from the CSIRO.

In examining the reserves proposed by the System 6 Study, the Committee has reviewed the boundaries of the Management Priority Areas (MPAs) designated by the Forests Department in its general working plans (No. 86 of 1977 and No. 87 of 1982) and has also studied the data and findings of an earlier review of MPAs made by representatives of Alcoa and the Forests Department.

The Committee is proposing to carry out its task in stages and in the first stage has examined proposed reserves which are fully within the area of Alcoa's Mining Lease MLlSA.

This first stage report conveys the Committee's findings and recommendations on those proposed reserves which are wholly within the lease and for which adequate information on the competing land uses and other factors is currently available. Detailed descriptions of the individual MPAs, together with an estimation of the impacts on other resources from the creation of the proposed reserves are included as an appendix to the report. Also attached are maps depicting the proposed boundaries for those reserves where modifications are recommended to the boundaries of the former MPAs.

1.2 PRINCIPAL RECOMMENDATIONS

(i) The Committee proposes that the following previously declared Management Priority Areas which are within Mining Lease MLlSA be designated Conservation Reserves - Dale, Eagle Hill, Windsor, Cooke, Serpentine, Karnet, Gooralong, Plavins, Trees Extension, Lennard, Preston, Noggerup, Mullalyup.

(ii) The Committee proposes that the boundaries of the Reserves provide for some excisions from the Cooke, Dale, Eagle Hill, Karnet, Plavins and Serpentine MPAs of areas either affected by dieback or draining away from the core, or both. Compensating additions are proposed to Dale to include part of the catchment which drains into the reserve and to Eagle Hill/Cooke to provide a link along the hills which form the backbone of these reserves.

(iii) Other proposed reserves within MLlSA including the Julimar, Duncan and Westralia MPA's that have been considered be further reviewed during the next stage.

2. STAGE I REVIEW

2.1 SCOPE

The initial stage of the review covered all MPAs falling totally within Alcoa's lease MLlSA. This was necessary to assess the residual representation of the various vegetation complexes in the western portion of the Darling Range. The full assessment of the representation of the vegetation complexes characteristic of the central, northern and eastern part of the Darling Ranges will not be possible until the review has been extended to cover other areas in the Northern Jarrah Forest including the Pacminex and Worsley leases and the Collie coal basin. However, these leases have little or no bearing on the areas of greatest conflict concerning conservation of complexes in the western part of MLlSA, namely the Plavins, Karnet and Serpentine MPAs.

2.2 BALANCING OF INTERESTS FOR THE PRESENT AND IN THE FUTURE

The key issue in these deliberations is the achievement of a balance of the interests of conservation and development in the long term. For example, in all boundary examinations it was assumed that dieback would spread downhil but that certain vegetation types are resistant. Knowledge of disease behavior is being progressively improved.

Another assumption is that Alcoa's currently indicative mining schedule will be followed. The time before mining is an important consideration. The following time frames for mining of or around the potential reserves have been provided by Alcoa:-

Short Term (less than 25 years): Serpentine, Samson, Murray, Federal.

Medium Term (25 - 50 years): Karnet, Eagle Hill, Plavins, Dale,Cooke, Windsor.

Long Term (greater than 50 years): Duncan, Bell, Surface, Nalyerin.

Low Interest: Gooralong, Teesdale, Trees, Lennard, Westralia, Preston, Noggerup, Mullalyup, Julimar.

Serpentine is the only MPA likely to be mined in the next 25 years and for which boundaries are contested. In the intervening years before mining commences it seems likely that better information will be collected and that community perspectives of resource values may change. By contrast some segments of the timber industry are being forced into operating within very short planning horizons in the light of the proposals being put forward by the Committee.

There are a number of potential water storage sites included within the recommended system of reserves. Accordingly the Committee advocates that consideration of further water developments proceed in a like manner to the principles enumerated by the Government when declaring the Murray Basin Jarrah Reserve. At that time, the Government noted that the Murray Basin Jarrah Reserve was created within a Water Reserve designated under the Metropolitan Water Act and declared that in creating the Jarrah Reserve the potential value of water resources in the area

would be recognised and in the procedures setting out the tenure and legislative status of the reserve, provisions would be made to ensure that the option of harnessing water resources in the reserve area is retained.

This is also in line with the recommendations of the Environmental Protection Authority contained in the Systems 1, 2, 3 and 5, Red Books namely:

> "It is essential that the importance of water be recognised, and when new reserves and forest parks are proclaimed it is proposed that water use be listed as one of the purposes where appropriate. This would not exempt water supply development proposals from proper environmental assessment and review processes before decisions were made in respect of the utilisation of water resources."

The System 6 report takes the further step of recognising that in respect of some potential conflicting uses, further information is required and recommends that statutory proclamation of MPAs should be progressively applied to secure the identified conservation MPAs following review by the Government of their conservation value in relation to potential for other uses. (System 6 'Red Book' Chapter 3).

The Committee believes, that in its review of the areas under initial consideration, recommendations have been reached which largely resolve the conflicts between conservation, bauxite mining, timber production and other uses. Demands likely to be generated by future development of water resources have been identified and clarified to a considerable extent. This is particularly relevant to the Eagle Hill Reserve (South Canning Dam), the Plavins Reserve (Swamp Oak Pipehead and Yarragil dams) and Lennard Reserve (Burekup damsite on the Collie River).

2.3 PRINCIPLES USED IN REVIEW OF LAND USE ALLOCATION

The basis for all deliberations was the recommendations arising from the System 6 Study. Abstracts from the System 6 Red Book are incorporated in this report in the sections which provide detailed descriptions of the proposed reserves.

The Committee formulated a set of principles for use as the basis for the review. These principles were followed in the considerations on the individual reserves and were as follows:

(1) Areas reserved for conservation should contain five to ten percent of the total occurrence of each vegetation complex within the study area, preferably more. In some cases this requirement cannot be met, because there is insufficient crown land representative of this vegetation complex remaining. The percentage of each vegetation complex in the reserves in the area covered by the DRSG is shown in Appendix 1, Table 1.

(2) The areas chosen should be the 'best' representation of those vegetation complexes available; this criterion being judged on freedom from disease, extent, lack of disturbance by timber harvesting and grazing, and species diversity. The core areas of the MPAs are normally the best representation of the vegetation complexes that can now be found in the Northern Jarrah Forest.

(3) Replication in space is desirable to provide security from local catastrophes and to represent local variants of each complex. The three 'best' reserves for each vegetation complex are listed in Appendix 1, Table 3.

(4) Reserves should be diverse where possible, containing a range of vegetation complexes. If an individual reserve is a comparatively small area, it is preferable that it be linked with others.

(5) The most important factor to be considered in deciding the boundaries of a reserve is the risk of disease spread. Dieback, the most dangerous disease of the region, spreads rapidly downhill which means that watersheds represent appropriate reserve boundaries in many cases. Dieback spread is greatest with extensive off-track land use (timber harvesting, off-road vehicles, mineral exploration and power lines) and less with intensive land uses (bauxite mining, agriculture and road construction). However these intensive industries can have a destabilising effect by

changing the hydrology of the area downslope and can thereby greatly intensify the impact of disease. In order to protect vegetation downslope from areas likely to be disturbed it is necessary to demonstrate that further human activities will not affect or will improve the viability of the downslope vegetation.

2.4 MAJOR ISSUES CONCERNING THE PROPOSALS

The representative of the Conservation Council emphasised the view of his Council that if considered in total, the proposed MPAs are inadequate from the point of view of contiguity and size, and that the preservation of landscape value is likewise inadequately considered. In recognition, from the conservation point of view, of the benefits of maximising the contiguity and size of reserves, the Committee has recommended increases to some reserves. As a result of this some of the reserves encompass areas which were not contained in the MPAs that were recommended in the System 6 report.

As a consequence of these proposals the timber industry will not have access to substantial areas in the Northern Jarrah Forest. The industry stands in need of alternative sources of timber supply in order to satisfy future timber demands in Western Australia. Supply shortages in ten to fifteen years have been predicted and will be exacerbated by designating the areas proposed as reserves. The timber industry operates on the expectation that regional timber supplies will be available in the future. In company with Alcoa, the timber industry requests that if the proposals are accepted then the Government guarantee that no further reserves, nor buffers to the proposed reserves will be established in the areas of MLlSA that have been considered to this stage in this review and that the available levels of timber resources shown in the Forests Department General Working Plan No. 87 of 1982 are maintained for the duration of the plan.

One of the key changes in status that are proposed is that in the conversion from MPAs to conservation reserves, all buffers not specifically excised for mining are to be given equivalent status to the core. It is recommended that in recognition of this major change that full access to other resources will be permitted up to the boundary edge (subject to sound management practice).

The Mines Department representative requested that the matter of mineral exploration and possible future development within the reserves be considered. The Committee recognised the broad implications and consideration of this matter was deferred.

The Committee recommends that when procedures for tenure and legislative practice for the proposed reserves are considered then the potential value of water resources be recognised along with the need to protect existing catchments and that when establishing management practices consideration be given to other recommendations put forward in the System 6 Study.

If the proposals are adopted there will be a need for Alcoa to be invited to enter into a legal agreement with the Government, declaring that the Company will forego the right to mine in reserves to be set aside for conservation purposes. There was a divergence of views within the Committee regarding future legislation and tenure to be adopted for the reserves. For example Alcoa has requested that the reserves remain within the Company's lease which would provide for the possibility that if, due to unforeseen circumstances, the reserves become unsuitable for conservation, and that the Government determines that mining be permitted, Alcoa will retain first option to mine. However the CCWA has requested that conservation areas in MLlSA be excised from the lease and afforded the same status as National Parks and nature reserves and as indicated elsewhere further views have been expressed by the Mines Department and Water Authorities and the timber industry.

3. SUMMARY OF RECOMMENDATIONS FOR INDIVIDUAL MPAs

Previous investigations carried out by representatives of the Forests Department and Alcoa identified in each MPA zones of low value for conservation (low conflict Forests Department, zone 1), low value for mining (low conflict Alcoa, zone 2) and high conflict due to high values for both land uses (zone 3). References to these zones are made in these summaries and in the more detailed appendix for each MPA. With a small number of exceptions the Committee proposes that zone 1 areas be excised and that zones 2 and 3 be included in conservation reserves.

3.1 JULIMAR MPA

Although the Julimar MPA falls within the Alcoa lease, the climatic difference is such that the vegetation complexes have greater affinity with the vegetation in the MPAs in the Worsley lease. Ore in Julimar is not relevant to Alcoa's present facilities for processing. However that portion of the Julimar MPA that falls into the Pacminex lease is understood to represent a significant proportion of the bauxite resources within that lease. Accordingly consideration of Julimar was deferred.

3.2 DALE MPA

The importance of Dale MPA lies primarily in the occurrence of an outstanding representation of Murray (L/M*) vegetation complex. However it is also important with respect to the Yarragil (M/H, maximum swamps) which is less affected by dieback here than perhaps any other part of the Darling

*The letters in brackets refer to the rainfall zone where the particular vegetation complex occurs. L/M refers to low to medium rainfall, M/H to medium to high rainfall. Others follow.

Range. The remaining vegetation types such as Yalanbee (L/M), while strongly represented here, are also well represented in other MPAs such as Gunapin, Sullivan and Boyagarring. Similarly, the Cooke vegetation complex while important here, is amply represented in such MPAs as Duncan, Cooke, Windsor and Eagle Hill. The designation of the conflict zones 2 and 3 areas as the conservation reserve would ensure that both the direct impact and indirect impact through dieback would be prevented in key portions of the reserve. Excising the south western portion of the MPA which drains into the Canning River would only affect those parts of the Yarragil (M/H) complex which are already infected with dieback and those portions of the Dwellingup (M/H) and Dwellingup and Yalanbee (L/M) which have been heavily logged. An addition is proposed to the MPA to the South East to provide protection to that part of the catchment which drains towards the core. The additional area would also increase the representation of the following vegetation complexes:

(a) Dwellingup, Yalanbee and Hester in the lower to medium rainfall zone;

(b) Pindalup/Yarragil in the lower to medium rainfall zone;

(c) Swamp type vegetation.

3.3 EAGLE HILL MPA

The two key features of the Eagle Hill MPA are the occurrence of the Murray (M/H) vegetation complex, which in this section between the existing Canning Dam and the proposed South Canning Dam is least likely to be affected by the development of the water resources and the Dwellingup (M/H) vegetation complex, part of which has not been logged. The MPA includes the entire occurrence of the Murray (M/H) vegetation complex between the two dams. Unlike the Murray Valley, this portion of the Canning Valley has not been subject to high recreational pressure due to the restrictions on access by the water supply authorities. The proposed adjustment of the boundaries would retain intact the bulk of the Murray (M/H) and the main part of the

Dwellingup (M/H) vegetation complexes and would ensure that dieback would not spread downhill into the reserve. Following field inspections by the Committee a modification to the boundaries in the area of low conservation value is recommended that will ensure survival of part of the Yarragil (M/H) complex occurrence in areas which are free of dieback. The main areas recommended for excision for mining in the south east and northwest are already heavily infected with dieback in the valleys.

3.4 RANDALL CORRIDOR

Eagle Hill is part of a chain of monadnocks running along Albany Highway. Between the Eagle Hill MPA and the Windsor and Cooke MPAs are Mount Randall, Mount Cuthbert and Mount Vincent. These have not been included in the System 6 proposals. However the Committee has formed the view that these areas have significant value to achieve contiguity as well as for conservation of vegetation types that are typical of the monadnocks and the adjacent lower slopes,especially the Yarragil Minimum Swamps and Yarragil (L/M). Accordingly the committee recommends that this additional area be designated part of the reserve. This would result in a continuous reserve of length of the order of thirty kilometres.

3.5 WINDSOR AND COOKE MPAs

The two MPAs are contiguous and share many characteristics and were considered conjointly. Both are important for conservation of the Cooke vegetation complex. In addition, the Windsor area also contains a significant occurrence of Yarragil (M/H minimum swamps) and Pindalup/Yarragil (L/M) protected by the adjacent Cooke surface. The Cooke MPA contains the second best occurrence of Dwellingup (M/H), parts of which have not been logged.

The area is subject to considerable pressure as a result of use by recreationists. The area of the Cooke MPA that was designated in the System 6 Study included extensive areas of valley dieback within the buffer. The excisions, which are recommended, chiefly involve occurrences of the Dwellingup vegetation complex that are separated from the core

by these dieback areas. In general terms, the Cooke MPA does not contain areas of high conflict between resources. However the Windsor MPA includes considerable areas that have high conservation value and also contain high grade bauxite deposits. As the areas in question drain into the core, and are important to the survival of the valley vegetation complexes (Yarragil and Pindalup/Yarragil), it is considered essential that mining be excluded from these areas and that the reserve boundaries be designated accordingly.

3.6 SERPENTINE, KARNET AND GOORALONG MPAs

These three MPAs are contiguous and were dealt with jointly. If designated as reserves the areas will be supplementary to the Serpentine National Park. The key vegetation complexes represented in these areas are Murray (M/H) and the Dwellingup (M/H).

In the Serpentine and Karnet MPAs, the bauxite ore values are very high. There is also a high occurrence of dieback, both in the valleys and on some of the uplands. The Committee engaged in long and protracted discussions to resolve the competing land use issues and decided to advocate a departure from the criteria that had been adopted in reviewing the bulk of the MPAs. Accordingly, the recommendations of reserve boundaries for the Serpentine, Karnet and Gooralong areas amount to retention of the main valleys and all dieback-free uplands within the reserve and the release of dieback-infected uplands draining away from the core for mining. An area of dieback affected uplands containing minor ore bodies is recommended for inclusion in the reserve as it lies between the proposed reserve and Serpentine National Park.
It is also recommended that Alcoa retain the right to conveyor access through the south west extension of Karnet as described in the Appendix.

The Committee recommends the exclusion from the Reserve and the release for mining of those parts of the former buffer area which drain towards the core, but are infected with dieback disease.
This provision should be made conditional upon a system of mining being developed and proven that will enable mining operations to proceed without destabilising the reserve.

It is further recommended that operations taking place in these areas be monitored during mining and that a reference base be established prior to commencement so as to ensure minimum adverse impact on the residual reserve. Bearing in mind that mining will only be permitted if the Company can demonstrate an appopriate system, in the meantime those portions of the buffer that have been excised and which drain towards the reserve should be managed as part of the reserve. This is in line with the System 6 recommendations.

The option of water supply as a future land use purpose in this reserve should not be excluded.

It is also recommended that the existing Serpentine Pipehead Dam water basin and outlet works be excluded from the Serpentine and Karnet reserves.

3.7 DUNCAN MPA

As part of this MPA falls within the Worsley lease consideration has been deferred until a later stage of review. The vegetation complexes which characterise the Duncan MPA are Dwellingup (L), Cooke and Pindalup and Yarragil (L/M) and are not of relevance to the resolution of the main conflicts occurring in the MPAs within Alcoa's lease.

3.8 PLAVINS MPA

The Plavins MPA contains outstanding occurrences of Dwellingup (H), Murray (M/H) and Yarragil (M/H minimum swamps), of which the latter is particularly important. In the area there is strong competition between the potential land uses involving major bauxite ore bodies, highly productive forests, important fresh water tributaries of the Murray River and high conservation values. It is recommended that that part of the former northern buffer which drains into the Davies Brook and that portion of the former core which drains into the Murray River but not into the Davies Brook, be released for mining. The northern buffer contains several occurrences of dieback. The remainder of the MPA is proposed as a conservation reserve and it is contiguous with the Murray River Reserve.

As stated earlier, the option for inclusion of water supply as a future land use purpose should be retained.

3.9 TREES MPA - EASTERN EXTENSION

This potential south-eastern extension of the Murray Valley Jarrah Forest Reserve consists primarily of former privately owned land that has been repurchased by the Public Works Department. Contained within the area are smaller reserves for water and resting places for travellers and stock. The private land has been heavily disturbed by clearing, especially along watercourses and by logging and grazing on the uplands. The small reserves have been only mildly disturbed and contain vegetation complexes (Pindalup/Yarragil (L/M)) which are rare as consequence of agricultural clearing in other areas. It is recommended that the small reserves together with the northern portion of the private property (north of the cleared main valley) be added to the Jarrah Forest Reserve and, where necessary, rehabilitated with indigenous species. The disturbed portion of this extension could be developed for recreational use. The southern portion including the cleared main valley should be retained under the control of the Public Works Department for experimental and extension purposes.

3.10 LENNARD MPA

Lennard MPA contains outstanding development of the Helena (M/H) and Darling Scarp complexes. It is, in fact, virtually the only MPA in which these complexes occur. In addition, there are significant occurrences of Dwellingup (H) complex on the periphery. The MPA also contains a small but significant area of undisturbed Murray (M/H) complex. The MPA can be described as State forest within and sloping towards the Collie River Valley between the wall of the Wellington dam in the east and private property on the Darling Scarp in the west. Because of this inward drainage and the outstanding occurrence of several complexes, it is recommended that the entire MPA be classified as a conservation reserve.

The option for inclusion of water supply as a future land use purpose should be retained.

3.11 WESTRALIA MPA

Although this MPA is rather small and has been subject to considerable disturbance, it is the only MPA containing the Collie and Muja vegetation complexes, which are characteristic of the Collie coal basin. In addition, there are small occurrences of Yarragil (M/H) and Dwellingup (H) vegetation complexes. The area is subject to considerable pressures from recreationalists and from nearby urban and industrial areas for other purposes. The main land use conflict within the Westralia MPA is not between bauxite mining and conservation but between conservation and coal mining and other forms of public land use, and accordingly the Committee considered it appropriate to defer specific recommendations on this reserve for the present. Consultation with the other Government Committees that are dealing with the land use matters in the Collie Basin is proposed.

3.12 PRESTON AND NOGGERUP MPAs

These two MPAs are contiguous and contain similar vegetation and were dealt with jointly. Within the Preston MPA there is a small but significant area of high quality jarrah forest of the Dwellingup (H) type which has never been logged. In addition both contain the only occurrences of the Catterick (M/H) and significant occurrences of the Lowdon complexes. The northern perimeters of both MPAs abut developed agricultural land. There should be no excision from these MPAs as this would result in reduction of the already inadequately represented Catterick and Lowdon complexes and it is recommended that the entire areas be designated conservation reserves.

3.13 MULLALYUP MPA

This MPA is characterised by great vegetation diversity and a high perimeter to area ratio. The private property which abuts much of the MPA boundary creates additional problems for management and protection.

Vegetation complexes contained within the MPA (Lowdon, Balingup and Bridgetown) are very poorly represented within the System 6 study area, chiefly because most of the land covered by these vegetation types was taken up for agriculture before declaration of any State forest.

The significance of the MPA is that although it is a relatively small and inadequate remnant area, additional supplementary areas are not available within Crown Land. Accordingly, the MPA should be added to the conservation reserve system.

3.1.4 SERPENTINE NATIONAL PARK, NORTH DANDALUP, STIRLING DAM AND WUNGONG

The declaration of these System 6 proposals appears to be acceptable and the Committee endorses the recommendations in favour of designating these areas as reserves. However, with the exception of the Serpentine National Park, they are water supply reserves and special arrangements will be needed to accommodate water supply activities.

3.1.5 OTHER RESERVES

The Committee has noted, but to this stage not considered in detail additional miscellaneous small reserves, enumerated by the System 6 Study, which fall within the area of the MLlSA lease. A sub group of the Committee has been formed to evaluate these areas and recommendations will be made in due course.

4. GENERAL PROPOSALS

4.1 The proposed linking of the MPAs from Eagle Hill to Windsor would create a contiguous reserve which crosses several existing lines of communication. It is recommended that a condition of creation of the Reserve be that the right of access by MWA, PWD, Forests Department, Timber Industry, Alcoa (ore conveyor) and for other essential purposes be retained along the Albany Highway, Ashendon Road, between Eagle Hill and Mount Randall and between Mount Vincent and Mount Cooke.

4.2 In regard to future management of the Reserves, the Committee wishes to record that there will be a need to develop fire management practices which are mutually compatible with adjacent land uses and to provide for access into the reserves for passive recreation and beekeeping.

4.3 Areas mined close to conservation reserves should be rehabilitated with indigenous rather than exotic species to protect reserves and integrate with them.

The Committee has formulated its recommendations by use of the best available data. However in the process certain deficiencies have become apparent. General recommendations 4.4 to 4.8 are aimed to assist acquisition of additional knowledge and future management practice of the Northern Jarrah Forest and are made to attempt to ensure that knowledge and consistent management of the Northern Jarrah Forest be improved in the future.

4.4 The area covered by computerised Forest Management Information System (FMIS) which was developed partly for the work of the Darling Range Study Group (DRSG) should be extended and made more accurate and comprehensive to contain all relevant data on dieback, bauxite ore bodies, reserve boundaries etc. FMIS should be made more flexible especially by the provision of cartographic capabilities. The aim should be to expand this data base to fulfil the requirements specified in Chapter 6 of the DRSG Report.

4.5 The knowledge of the ecology of the Northern Jarrah Forest should be improved and officers trained within Government to provide professional advice in this area. The need for the principles of the ecology to be utilised in the management the Northern Jarrah Forest and other areas should be part of the training of the professionals who will staff the new Department of Conservation and Land Management and as such it might be reasonable to locate the research to gain this knowledge in an appropriate teaching institution.

4.6 More detailed mapping of the ecosystems of the Northern Jarrah Forest should proceed with priority being given to conservation reserves in the western portions.

4.7 By the criteria used in this review, the following vegetation complexes are inadequately represented: Dwellingup (H), Yarragil Minimum Swamps, Lowden, Darling Scarp, Forrestfield, Catterick, Bridgetown, Collie, Cardiff and Muja. These inadequacies should be considered in future land use planning.

4.8 Monitoring of the downhill consequences of road building and bauxite mining is a matter of high priority, especially with respect to the conditional access zones that have been recommended for the Serpentine and Karnet reserves. The importance of this issue should be conveyed to the appropriate research committees.

SECTION 5 APPENDIX 1

DETAILED REVIEW OF MPAs

DALE MPA

1. The summary of this MPA's attributes, and of the relevant recommendations made by the System 6 Report, are attached.

C32 DALE MANAGEMENT PRIORITY AREA

The recommended area is situated about 50km south-east of Perth and comprises State Forest, being Dale Management Priority Area. The management priority as designated by the Forests Department is conservation of flora, fauna and landscape, and catchment protection. Also included in the recommended area is part of Location 10383, freehold land held in the name of the Conservator of Forests (Figure 25).

The area is within the Mundaring and Canning River Catchments, sources of water supply, and so Catchment Zone Regulations apply. The locality is within the Alcoa Mining Lease and the southern portion has long-term potential for bauxite mining. The MRD states that it will require gravel from the buffer area of the MPA for construction and maintenance of Brookton Highway.

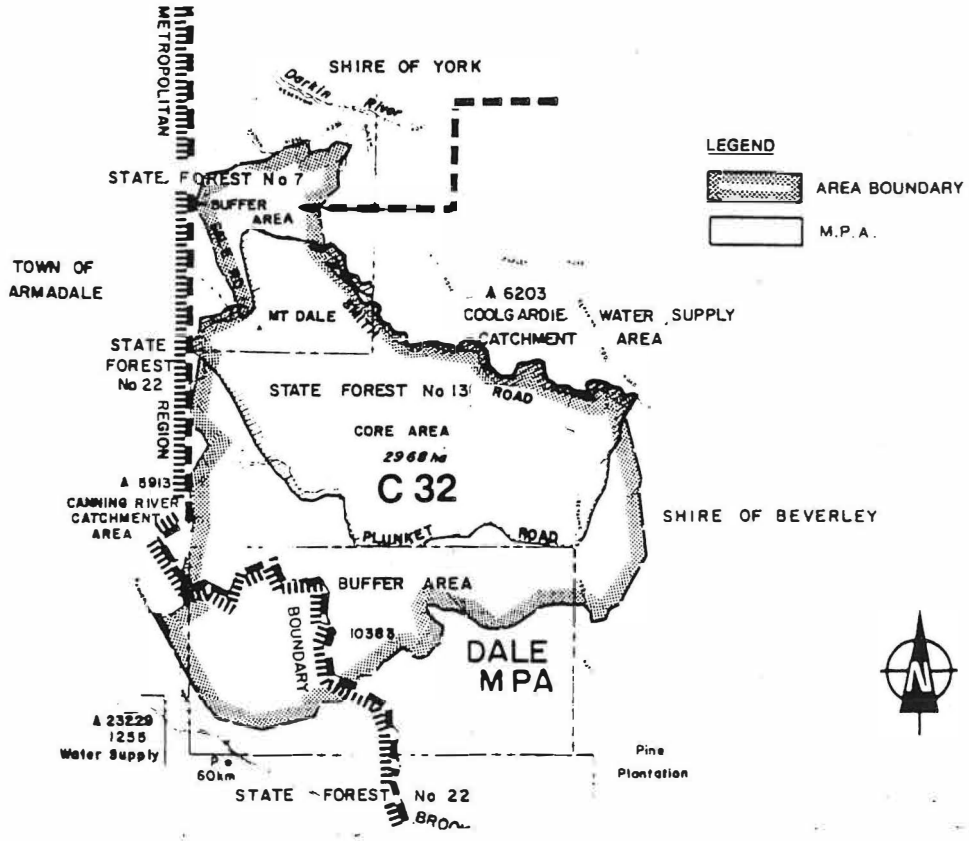
Dale MPA contains a broad range of features: lateritic uplands support open-forest of jarrah and marri with an understorey of sheoak; jarrah woodland, shrubland, herbland and a lithic complex occur on shallower soils and granite outcrops; wandoo and flooded gum woodlands occur in the valleys. The MPA conserves several vegetation types which have been severely affected by dieback elsewhere in State Forest. The south-western edge of the MPA contains springs which are valuable for conservation.

Mt. Dale is popular for walks and picnics, but uncontrolled access may affect the area.

Recommendations:

C32.1 That the procedure outlined in general recommendations 1 to 5, Chapter 2, be applied to Dale MPA.

C32.2 That the Forests Department prepare its management plan in consultation with the Public Works Department and the Department for Youth, Sport and Recreation.



2. Additional Information

Additional information is contained in the Report on Land Use in the Darling Ranges (DRSG Report) and other sources. The Dale MPA contains the following vegetation complexes in buffer and core: Dwellingup and Yalanbee (L/M), Murray (L/M), Yarragil (M/H, Max. Swamps), Cook, Dwellingup (M/H), Pindalup and Yarragil (L/M) and Swamp. (See Appendix 1, Table 1 for areas in proposed reserve.) Of these, of greatest significance are the occurrence of Murray (L/M) and Yarragil (M/H) complex. The former is under represented in the overall MPA system, the latter is usually, due to its position low in the landscape, strongly affected by dieback. In this MPA, the level of dieback infection is relatively low.

In terms of the timber resources, the estimated volume of sawlogs in the total MPA is 19 660 m^3, of which 8 600 m^3 is contained in the buffer.

The bauxite ore is primarily concentrated in the central and southern portion of the MPA, that is within the buffer. The estimate is about 10 million tonnes of which 3 million is in the core.

The MPA is an important part of the Helena water catchment. It is anticipated that in view of the steep dissection of much of the MPA, the runoff per unit area is higher than normal for this rainfall zone, and salt accumulation correspondingly lower. Should a second storage dam be constructed on the southern branch of the Helena River (Darkin River) it would probably affect the northern-most portion of the core.

3. Conflict Zones

In Dale MPA, the conflicts between potential land users are rather strong, but the patterns are clearly defined. In the first stage of the Forests Department/Alcoa joint study, the core, although containing some large isolated ore bodies, was defined as being a zone of low conflict for bauxite mining and thereby classified as Zone 2. The SW portion of the buffer, which drains away from the core and contains extensive development

of dieback, was considered to be a zone of low conflict for conservation purposes (Zone 1). The intermediate portion between the core and the Helena-Canning divide was considered to be a zone of high conflict (Zone 3). This is due to the importance of keeping the Yarragil (M/H) complex within the core dieback free. Because of the high quantities of bauxite ore, the area was also considered to have high importance to Alcoa's medium range (25-50 years) mining plans.

4. Proposals

It is proposed that all of that portion of the Dale MPA which drains into the Helena River (conflict zones 2 and 3) be created a Conservation Reserve. That portion of the MPA which drains into the Canning River (conflict zone 1) be excised from the MPA and be available for bauxite mining. In the meantime, the area should be managed as production forest.

It is also recommended that the Reserve be enlarged by the addition of an area of 15.49 km^2 to the south east, wholly within the Beraking Brook catchment. The north eastern boundary of the Reserve should follow the 200 m AHD contour to exclude the river section below this level.

5. Consequences of the proposals

The status of the MPA will be altered from a core and buffer of 63.52 km^2 to a reserve, of total area of 70.54 km^2.

The effects of the excision and addition on the various land uses will be as follows:

a) Conservation of Flora and Fauna

The risk of dieback introduction into the core, which would seriously endanger the Yarragil (M/H, Maximum Swamp) complex, will be reduced by exclusion of even partial logging from that portion of the buffer draining into the core. The Dwellingup (M/H) and Dwellingup and Yalanbee (L/M)

complexes will retain structural integrity within the proposed reserve, to a greater degree than would occur if the former buffer had been selectively logged. The representation of vegetation complexes will be varied within the MPA by

Yarragil (M/H), Min. Swamp	by 1.51 km^2	(increase)
Yarragil (M/H), Max. Swamp)	by 3.96 km^2	(decrease)
Swamp	by 1.13 km^2	(increase)
Dwellingup and Yalanbee (L/M)	by 2.28 km^2	(increase)
Yarragil (L/M)	by 6.06 km^2	(increase)

The bulk of the Yarragil and Swamp complexes recommended for excision is dieback infected. The contiguity, and the area/boundary ratio will be largely retained, as there is no major change in shape.

b) Bauxite Mining

Several ore bodies, estimated to contain about ten million tonnes of ore, will be included in the reserve. One million tonnes of ore, scheduled for mining within the 25-50 year envelope, will be made accessible for extraction.

c) Timber Industry

The reserve proposal will withdraw access to 16 720 m^3 of sawlog timber, of both jarrah and wandoo, which is 2 590 m^3 more than that provided for the Dale MPA in the 1977 and 1982 Forests Department General Working Plans. A very rough estimate of future increment foregone is between 1 080 m^3 and 3 240 m^3 of sawlog per annum, assuming growth increments of 0.2 to 0.6 m^3/ha per year, which is a reasonable range for the dominant vegetation complexes of the area.

d) Water Supply

Conflict between future dam construction on the Darkin River and the conservation reserve, will not occur if the reserve boundary is as proposed. The initial MPA and the proposed modifications are compatible with catchment protection. The area now recommended for mining is of mild topography, and a considerable distance upstream from the Canning Dam, so that turbidity would not be a major problem. As the area falls within the intermediate salinity zone, the findings of the trial mining project to determine whether mining raises stream salinity will be relevant and should be incorporated into management practice.

EAGLE HILL, WINDSOR AND COOKE MPAs

1. Introduction

The three MPAs, and the connecting corridor encompassing Mt Randall, Mt Vincent and Mt Cuthbert, were considered jointly because they are contiguous, and share many characteristics. The summary of the attributes of the three MPAs, together with the relevant recommendations resulting from the System 6 Report are given below.

C36 EAGLE HILL MANAGEMENT PRIORITY AREA

The recommended area is situated about 50km south-east of Perth and comprises State Forest, being Eagle Hill Management Priority Area. The management priority as designated in the Forests Department's Working Plan No. 87 is conservation of flora, fauna and landscape (Figure 28).

Most of the MPA is within the Canning River Catchment, a water supply source, and public access is restricted by Catchment Zone regulations. There are several springs alongside Eagle Hill Ridge of particular importance for the MWA. The MWA may require access for construction of the proposed South Canning Dam although the dam will not actually inundate the MPA. The area may be affected by future requirements of Albany Highway. It is within the Alcoa Mining Lease and has considerable medium-term potential for bauxite mining.

The outstanding features of Eagle Hill MPA, besides extensive open-forest of jarrah and marri, are some uncut and relatively undisturbed stands of yarri along the Canning River valley, stands of the rare butter gum, some extensive stands of black gin and a wide range of plant species associated with the Mt Cooke-Mt Randall chain of monadnocks. Recreational use of the area will increase.

Recommendations:

C36.1 That the procedure outlined in general recommendations 1 to 5, Chapter 2, be applied to Eagle Hill MPA.

C36.2 That the Forests Department prepare its management plan in consultation with the Public Works Department and the Department for Youth, Sport and Recreation.

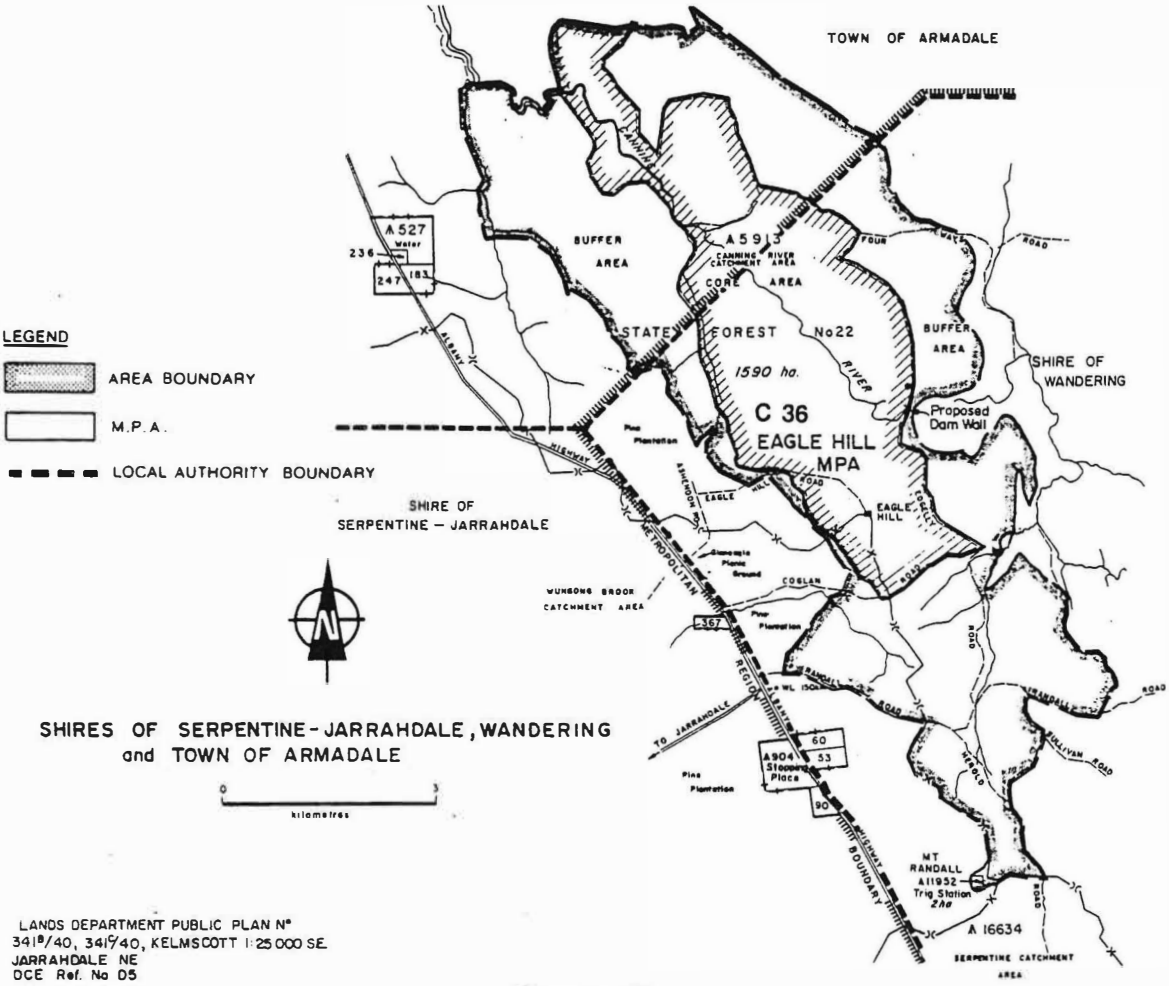

TOWN OF ARMADALE
LEGEND
AREA BOUNDARY
M.P.A.
LOCAL AUTHORITY BOUNDARY
SHIRE OF SERPENTINE – JARRAHDALE
SHIRE OF WANDERING
BUFFER AREA
CORE AREA
STATE FOREST No22
1590 ha.
C 36
EAGLE HILL
MPA
Proposed Dam Wall
A 5913
A 527
Water
236
247
183
RIVER
ROAD
HIGHWAY
EAGLE HILL ROAD
COGLAN ROAD
WUNGONG BROOK CATCHMENT AREA
METROPOLITAN REGION SCHEME
TO JARRAHDALE
367
A904
Stoppers Place
60
53
90
MT RANDALL
A11952
Trig Station
2nd
A 16634
SERPENTINE CATCHMENT AREA
SHIRES OF SERPENTINE-JARRAHDALE, WANDERING
and TOWN OF ARMADALE
0
3
kilometres
LANDS DEPARTMENT PUBLIC PLAN N°
3418/40, 3419/40, KELMSCOTT 1:25 000 SE.
JARRAHDALE NE
DCE Ref. No 05

Figure 28

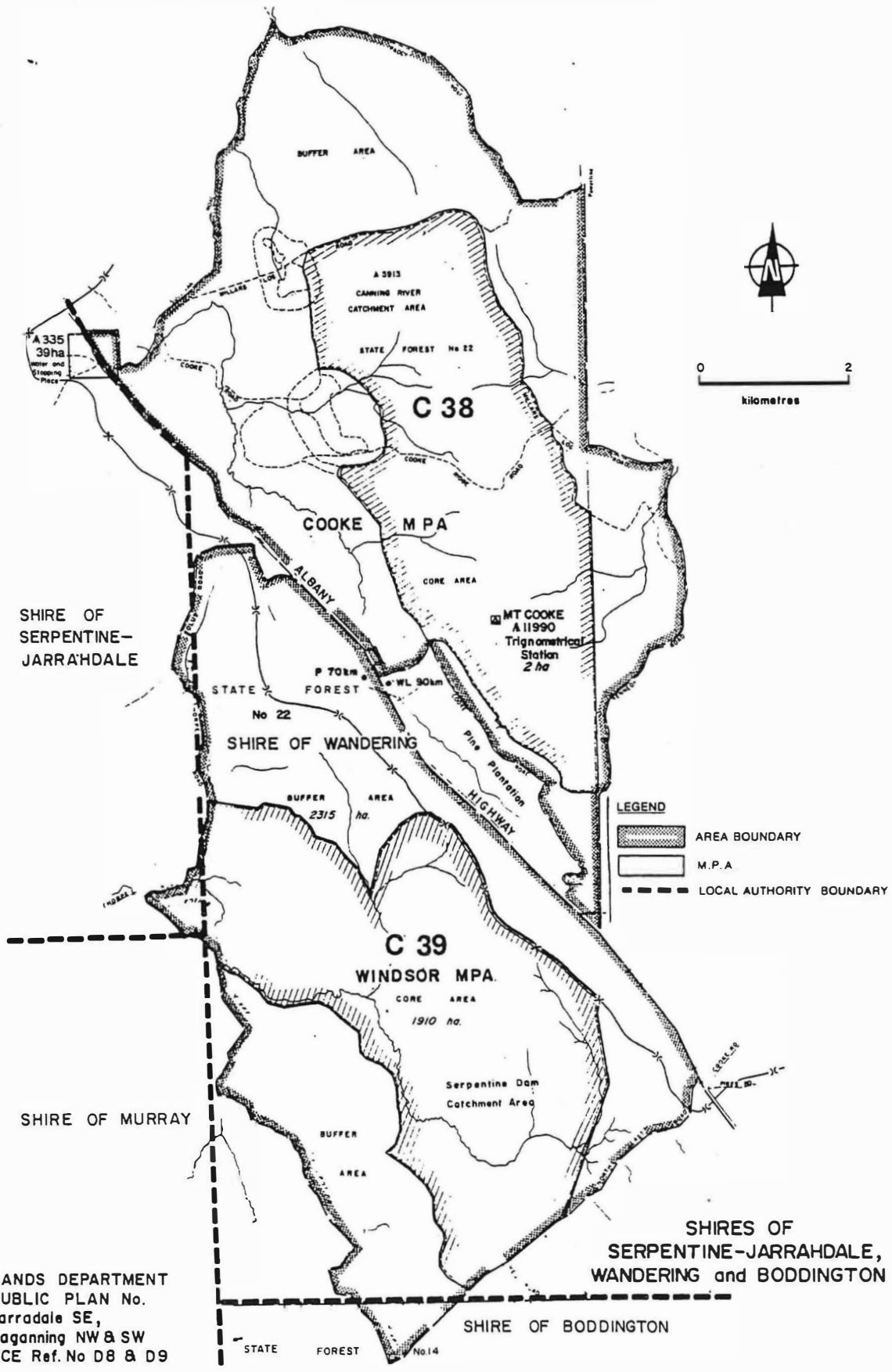

BUFFER AREA
A 3913
CANNING RIVER
CATCHMENT AREA
STATE FOREST No 22
A 335
39ha
C 38
COOKE M P A
CORE AREA
ALBANY
MT COOKE
A 11990
Trignometrical
Station
2 ha
SHIRE OF
SERPENTINE-
JARRAHDALE
P 70km
WL 90km
STATE FOREST
No 22
SHIRE OF WANDERING
Pine Plantation
HIGHWAY
BUFFER AREA
2315 ha.
0
2
kilometres
LEGEND
AREA BOUNDARY
M.P.A
LOCAL AUTHORITY BOUNDARY
C 39
WINDSOR MPA.
CORE AREA
1910 ha.
Serpentine Dam
Catchment Area
SHIRE OF MURRAY
BUFFER
AREA
SHIRES OF
SERPENTINE-JARRAHDALE,
WANDERING and BODDINGTON
LANDS DEPARTMENT
PUBLIC PLAN No.
Jarradale SE,
Yaganning NW & SW
DCE Ref. No D8 & D9
SHIRE OF BODDINGTON
STATE FOREST No.14

Figure 30

C38 COOKE MANAGEMENT PRIORITY AREA

The recommended area is situated about 70km south-east of Perth and most of it comprises State Forest, being Cooke Management Priority Area. The management priority as designated by the Forests Department is conservation of flora, fauna and landscape, and catchment protection. Also included in the recommended area is part of Reserve C335, for Watering and Stopping Place for Teams, under the control of the Shire of Wandering (Figure 30).

The area is popular for bushwalking and rock climbing. The area is within the Canning River Catchment, a water supply source. Public access is restricted by Catchment Zone regulations. There are SEC lines and more are proposed. Future requirements for Albany Highway may affect the area. The MRD states that it will require small quantities of gravel from the area. It is within the Alcoa Mining Lease and has long-term potential for bauxite mining.

Cooke MPA is of particular value for an area of uncut jarrah forest on the uplands and a chain of monadnocks covered in part by stands of the rare butter gum. The main vegetation type is open-forest of jarrah mixed with marri; also open-woodland of wandoo occurs in the valleys with various species of *Melaleuca* and other typical swamp plants dominating the moister parts. Lichens, herbfields and thickets of grevillea and hakea are associated with granite outcrops and gravelly soils on the slopes carry various species including jugflower and zamia.

The southern portion of Cooke MPA contributes to open space of regional significance extending along Albany Highway (see Figure 1, Chapter 4) because of its high scenic, conservation and recreation value.

Recommendations:

C38.1 That our general recommendations on planning and management of Regional Parks be applied to this area (see Recommendations 15 and 16, Chapter 5).

C38.2 That the procedure outlined in general recommendations 1 to 5, Chapter 2, be applied to Cooke MPA.

C38.3 That the part of Reserve C335 which lies east of Albany Highway be excised, added to State Forest and managed as part of Cooke MPA.

C39 WINDSOR MANAGEMENT PRIORITY AREA

The recommended area is situated about 70km south-east of Perth and comprises State Forest, being Windsor Management Priority Area. The management priority as designated in the Forests Department's Working Plan No. 87 is conservation of flora, fauna and landscape (Figure 30).

Recreational pressure may increase in the future because the area is surrounded by three main roads, including Albany Highway. The area is within the Serpentine Dam and Canning River Catchments, water supply sources, and public access is restricted by Catchment Zone regulations. There are SEC lines and more are proposed. The area may be affected by future requirements for Albany Highway and the MRD states that it will require small quantities of gravel. It is within the Alcoa Mining Lease and has long-term potential for bauxite mining.

Windsor MPA contains a range of vegetation types. Associated with lateritic uplands and a chain of monadnocks are open-forest of jarrah, open-woodland of wandoo and a lithic complex on the granite rocks. Broad valleys and swampy valley floors support wandoo, mixed stands of jarrah, marri and yarri, and species typical of swampy areas such as *Melaleuca*. The last are important in sheltering a variety of native animals.

The northern portion of Windsor MPA contributes to open space of regional significance extending along Albany Highway (see Figure 1, Chapter 4) because of its high scenic, conservation and recreation value.

Recommendations:

C39.1 That our general recommendations on planning and management of Regional Parks be applied to this area (see Recommendations 15 and 16, Chapter 5).

C39.2 That the procedure outlined in general recommendations 1 to 5, Chapter 2, be applied to Windsor MPA.

2. Additional Information

Supplementary information is available from the Report on Land Use in the Darling Ranges, and from other sources. The three MPAs contain the following vegetation complexes: Dwellingup (M/H), Dwellingup and Yalanbee (L/M), Cooke, Murray (M/H), Yarragil (M/H, Min. Swamps), Yarragil (M/H, Max. Swamps), Swamp and Pindalup and Yarragil (L/M) (see Appendix 1, Table 1). Of these, of the greatest significance are Murray, Cooke, Pindalup and Yarragil (L/M) and Dwellingup (M/H). The Cooke complex is relatively safe in all respects as it occurs high in the landscape, generally above existing roads, and as yet is largely unaffected by dieback. The Dwellingup (M/H) is intermediate, in that it generally occurs on the uplands. However it has been traversed by several roads, and has been subject to logging, so that the occurrence of dieback is higher. The Murray complex, though exposed to infection by its occurrence in low positions in major valleys, such as that of the Canning River in the Eagle Hill MPA, is not greatly affected by the disease. The Pindalup and Yarragil (L/M) vegetation complex is in greatest risk as its occurrence is invariably in the low part of the landscape, is traversed by the greatest number of roads, and by virtue of its water-gaining nature, is particularly prone to higher dieback impact.

In terms of timber resources, the estimated sawlog volume contained in Eagle Hill, Cooke and Windsor MPAs is 98 000 m^3 of timber, the bulk of it occurring within the area designated as MPA buffers. It is unevenly distributed within the vegetation complexes. In the Pindalup-Yarragil vegetation complex, the standing volume and the productive capacity have been severely reduced by the dieback disease. The bulk of the standing volume occurs within the Dwellingup complex. The Cooke complex, by virtue of its steep slopes and shallow soils, has never carried high volumes of timber, in fact much of this complex is treeless, carrying only shrublands, herb fields and moss fields. The prediction of likely loss of future productivity is made extremely difficult by the complex interaction of site and dieback.

For the dieback-free uplands of the Dwellingup M/H complex and the fertile slopes of the Murray (M/H) complex, the sawlog growth increment may reach 1.0 m^3 per hectare per year, but this tapers off to virtually nothing in considerable parts of the Cooke and Pindalup-Yarragil complexes.

The bauxite ore is primarily concentrated within the previously designated buffer areas, although there are some significant ore bodies in those parts of the cores which consist of the Dwellingup (M/H) complex, particularly along the eastern and northern boundaries of Cooke and the western and northern boundaries of Windsor. The total ore resource in the MPAs is estimated at 33 million tonnes of ore.

In the Cooke and Windsor MPAs, situated on or near catchment boundaries, there is not any present risk of major turbidity problems resulting from either dieback spread, or from bauxite mining. However, should the proposed South Canning Dam be developed, it would abut the eastern boundary of Eagle Hill MPA. The north western portion of Windsor is likewise only about 5 km from the top end of the eastern arm of the Serpentine Dam. In the Eagle Hill MPA, the bauxite ore bodies are much closer to the proposed South Canning dam, and the turbidity risk is correspondingly higher. The runoff per hectare is anticipated to be particularly high from the Cooke and Pindalup complexes because of the steepness and naturally poor vegetation cover of the former and a strong reduction of vegetation cover caused by dieback occurrence in the latter.

The reduction of cover in the Pindalup-Yarragil complex caused by dieback has already resulted in raised groundwater levels and increased salinity of the stream separating Cooke and Windsor MPAs. This trend has been reversed by the planting of pines in the dieback affected area.

3. Conflict Zones

There are no significant conflicts between conservation and bauxite

mining within the core of Eagle Hill MPA, which consists chiefly of dissected valley slopes and the slopes of the monadnock, but conflicts are high on the lateritic upland flanks. The valley itself and the monadnock have both been assessed as Zone 2 (not contested by Alcoa). The surrounding lateritic uplands are a zone of high conflict (3).

In the Cooke MPA the conflicts are relatively low, as the bulk of the ore reserves occur in the buffer and are separated from the core by extensive occurrence of dieback. For this reason only two categories were arrived at in the earlier Alcoa/Forests Department evaluations. The outlying occurrences of high ore concentrations in other areas of the buffer were viewed by the Forests Department as being of low importance to the survival of the core for conservation purposes and Alcoa, on its part, recognised the importance of all portions of the buffer draining towards the core for the long term survival of the core.

In the Windsor MPA the situation proved far more complex because the core consists of two main landscape features, the monadnock in its eastern portion and a broad valley of one of the tributaries of the Serpentine River in the western portion of the MPA. The need to preserve the core was not questioned by Alcoa and those portions of the buffer sloping away from the core were correspondingly not considered essential for conservation by the Forests Department. There were, however, two areas outside of the core, but draining towards it, which contain particularly high volumes of ore, that could not be mined without endangering the core. The earlier evaluations placed these areas in Conflict Zone 3, that is high conflict.

4. Proposals

As a consequence of the Reserve Committee discussions, it is proposed that the three MPAs be joined by a corridor into one large reserve, as seen on attached maps. It is proposed that certain sections of the buffers of the Eagle Hill and Cooke MPAs be allocated for timber supply and mining.

The net outcome of these changes is shown on the attached maps.

5. Consequences of the Proposals

The status of the MPAs will be altered from three cores and three buffers to a reserve of total area of 156 km^2.

The name Monadnock Reserve is suggested to simplify nomenclature.

a) Conservation of Flora and Fauna

The recommendation of the modification of the boundaries will result in an increased security for those parts of the former buffer areas not recommended for excision for mining. The excisions and additions will alter the representation of the various vegetation complexes only slightly, in most cases increasing representation marginally. The representation of the Murray (M/H) complex will fall slightly by 1.01 km^2.

The area to perimeter ratio will not be sufficiently affected by the proposed readjustments, even though the new combined reserve is strongly elongated along the north-south axis.

b) Bauxite Mining

The proposed reserve will contain several very large ore bodies estimated to contain about 30 million tonnes of bauxite. However the net effect of the proposals will be that about 10 million tonnes of ore scheduled for mining in the 25-50 year period will be made accessible for extraction.

c) Timber Industry

The proposed expanded reserve will contain 84 783 m^3 of timber, primarily jarrah. This is an increase of 17 783 m^3 over the estimate for the MPAs designated in the 1977 and 1982 General Working Plans.

d) Water Supply

As some of the ore bodies occur on slopes somewhat steeper than is the case in other parts of ML1SA and as the three MPAs fall into the intermediate salinity zone, mining within the area will need to incorporate technology which is expected to be developed during the trial mining project. The area proposed as a reserve will be in harmony with the objectives of catchment protection and no special provisions will be needed except perhaps for the rehabilitation of some dieback-affected areas, some of which have been planted with pines. For these purposes local species of known tolerance to dieback (yarri, marri, wandoo and powder bark wandoo) rather than exotic species should be used in the rehabilitation.

For the northern portion of the proposed reserve, the management practices will need to provide for the maintenance of high quality water supplies from the area. However, there should be harmony between the further development of the water resources and the conservation aims. Development of the Scenic Drive as the main access to the proposed South Canning Dam should be avoided. Instead an alternative route to the dam should be selected to preserve the integrity of the reserve.

e) Recreation

Existing recreation patterns outside the reserve should be maintained. If the proposed South Canning Dam is constructed and its environs opened to recreation, any development of recreational facilities should be outside and preferably away from the proposed reserve.

SERPENTINE, KARNET AND GOORALONG MPAs

1. Introduction

The three MPAs are dealt with jointly as they are contiguous and share

many characteristics. The areas were initially conceived as a supplement to and buffer for the Serpentine National Park.

The summary of the attributes of these MPAs, and the relevant recommendations made by the System 6 Report, are given below:

M84 GOORALONG MANAGEMENT PRIORITY AREA

The recommended area is situated about 40km south-east of Perth and most of it comprises State Forest, being Gooralong Management Priority Area. The management priority as designated in the Forests Department Working Plan No. 87 is conservation of flora, fauna and landscape. Also included in the recommended area are Reserves B988, for Rockingham Jarrah Timber Company, not vested, and B990, for Camping, vested in the Shire of Serpentine-Jarrahdale; Cockburn Sound Locations 178, 306, 333 and 624, freehold land held in the name of the Crown; and Cockburn Sound Location 68, privately owned freehold land (Figure 150).

The MPA is within the Gooralong Brook Water Reserve. A dam is to be built on the Serpentine River below the junction of the Carralong and Gooralong Brooks and public access may be restricted by Catchment Zone regulations. The area is within the Alcoa Mining Lease but has little potential for bauxite. Army training has taken place within it.

The MPA is important in conserving vegetation types which are poorly represented in other reserves in the high rainfall areas as a result of clearing and damming.

Upland vegetation includes open-forest of jarrah and marri, with an understorey of bull banksia and snottygobble. The valley consists of open-forest of jarrah and marri with some yarri and a shrub understorey. Wandoo woodlands occur on the Darling Scarp. Some of the area within the MPA is uncut and relatively undisturbed.

The area is extensively used for recreation such as bushwalking and camping.

This area, together with Serpentine National Park (M85), Karnet MPA (M86) and Serpentine MPA (M87), which includes freehold land held privately and by various Government agencies, Land Act Reserves (including a National Park), State Forest and water catchment areas, constitutes open space of regional significance (see Figure 1, Chapter 4). It also contributes to the larger area of regional open space extending along the Darling Scarp. The area is of regional significance because of its high conservation and recreation values and its proximity to Perth residential areas and nearby rural settlements. Not all the land under the various tenures has conservation and recreation as primary management objectives and to enhance these values the management structure, together with that of M85, M86 and M87, requires coordination. Important management considerations for the area include the need for fire protection, allowing only those recreation activities which are compatible with the conservation of flora and fauna, and the phasing out of army training programmes.

Recommendations:

M84.1 That our general recommendations on planning and management of Regional Parks be applied to this area (see Recommendations 15 and 16, Chapter 5).

M84.2 That the procedure outlined in general recommendations 1 to 5, Chapter 2, be applied to Gooralong Management Priority Area.

M84.3 That Reserve B990 be cancelled and its area added to State Forest to be managed as part of Gooralong Management Priority Area.

M84.4 That Reserve B988 be cancelled and its area added to State Forest to be managed as part of Gooralong Management Priority Area.

M84.5 That the freehold land held in the name of the Crown be managed by the Forests Departments as if part of Gooralong Management Priority Area.

M84.6 That, if Recommendation M84.2 is implemented and if alternative camping facilities are required, the Forests Department consult the Serpentine-Jarrahdale Shire Council and other relevant authorities for the purpose of land exchange.

M84.7 That the portion of Gooralong Management Priority Area situated between Cockburn Sound Locations 361 and 436, be excised and added to Reserve A28862 (see M85).

M85 SERPENTINE NATIONAL PARK

The recommended area is situated about 45km south-east of Perth and comprises Reserve A28862, for National Park, vested in the National Parks Authority; Reserves C26079 and C26080, for Gravel, both vested in the Shire of Serpentine-Jarrahdale; Reserves C32201, for Government Requirements and C32202, for Conservation of Flora and Fauna, both not vested; Cockburn Sound Locations 79, 143, 251-54, 256, 257, 261, 272, 347, 425, 436 and 463, freehold land owned by the Metropolitan Water Authority; Cockburn Sound Locations 255, 260, 262, 299, 331 and 1748, privately owned freehold land; Cockburn Sound Location 361, freehold land held in the name of the Crown; and Cockburn Sound Location 463, freehold land owned by the SEC (Figure 150). Part of the area is "reserved" for Parks and Recreation under the Metropolitan Region Scheme, and that part of the area situated on the face of the Darling Scarp is included in an area indicated by the MRPA to have significant landscape merit, which should eventually be "reserved" for Parks and Recreation under the Metropolitan Region Scheme.

Most of the northern section of the area is within Gooralong Brook Water Reserve. The area may be affected by a proposed pipehead dam just below the confluence of Carralong and Gooralong Brooks on the Serpentine River. This would inundate Cockburn Sound Locations 79, 143, 251, parts of 254, 257, 347, 425 and 436, and a historic homestead. Public access would be restricted by Catchment Zone regulations. The area may be affected by an SEC combined water supply and pumped storage installation, to be sited south of the proposed pipehead dam. The area is within the Alcoa Mining Lease, but has little significance for bauxite mining. The Serpentine — Jarrahdale Shire Council is currently extracting gravel from Reserve C26080.

The area consists of deeply incised lateritic uplands. It is drained by the Gooralong Brook and the Serpentine River. Two rare species of trees occur in the National Park: butter gum on the slopes and salmon white gum at the foot of the Darling Scarp.

The upland vegetation includes open-forest of jarrah and marri, with an understorey of bull banksia and snottygobble. The valleys contain open-forest of jarrah and marri with some yarri and a shrub understorey. Wandoo woodlands occur on the Darling Scarp. Dieback has been recorded, mainly in the gullies.

Cockburn Sound Location 262, which adjoins the Park, provides spectacular views and supports extensive stands of rock sheoak.

The National Park is small and has lengthy and indented common boundaries with cleared and uncleared freehold land. Management difficulties exist as a result of frequent uncontrolled fires, straying stock and the invasion of exotic plant species.

Since the National Parks Authority's manpower is limited, reduction of the ratio of Park boundary to area, through inclusion of adjacent reserves and freehold land in the Park, would make the area more viable as a National Park.

Because of its accessibility and attractiveness, the area is important for recreation and education. Recreational use is currently focussed on the Serpentine Falls, a popular swimming spot. Both conservation and recreation could be accommodated by careful management.

The recommended area, together with Gooralong MPA (M84), Karnet MPA (M86) and Serpentine MPA (M87), which includes freehold land held privately and by Government agencies, Land Act Reserves, State Forest and water catchment areas, constitutes open space of regional significance (see Figure 1, Chapter 4). It also contributes to the larger area of regional open space extending along the Darling Scarp. The area is of regional significance because of its high conservation and recreation value and its proximity to Perth's residential areas and nearby rural settlements. Not all land under the various tenures has conservation and recreation as primary management objectives and to enhance these values the management structure, together with that of M84, M86 and M87, requires coordination. Important management considerations for this area include rationalisation of the common boundaries of the National Park and the MPAs; the need for fire protection; allowing only those recreation activities which are compatible with the conservation of flora and fauna; developing educational programmes; and safeguarding the scenic values of the waterfall.

Recommendations:

M85.1 That our general recommendations on planning and management of Regional Parks be applied to this area (see Recommendations 15 and 16, Chapter 5).

M85.2 That Reserves C26079 and C26080 be cancelled and their respective areas added to Reserve A28862.

M85.3 That Reserves C32201 and C32202 be cancelled and their respective areas added to Reserve A28862.

M85.4 That the freehold land held in the name of the Crown, Location 361, be added to Reserve A28862.

M85.5 That part of State Forest No. 22, within Gooralong Management Priority Area and abutting Cockburn Sound Locations 361 and 436, be excised and added to Reserve A28862.

M86 KARNET MANAGEMENT PRIORITY AREA

The recommended area is situated about 55km south-east of Perth and most of it comprises State Forest, being Karnet Management Priority Area. The management priority as designated in the Forests Department's Working Plan No. 87 is conservation of flora, fauna and landscape. The recommended area also includes Cockburn Sound Location 308, freehold land owned by the MWA; and Cockburn Sound Locations 107, 239, 242, 245, 267 and 363, privately owned freehold land (Figure 150).

The area is subject to a number of pressures:

(i) Most of the MPA comes within either the Gooralong Brook Water Reserve, Serpentine Pipehead Dam Catchment or Dirk Brook Water Reserve. A dam proposed for the Serpentine and a pipehead dam proposed for Dirk Brook may affect the area in which case public access would be restricted by Catchment Zone regulations.

(ii) The area may be affected by proposed SEC lines.

(iii) The MRD requires access to gravel in the MPA; extraction may possibly be confined to the buffer zone.

(iv) The area is within the Alcoa Mining Lease and has high medium-term potential for bauxite.

Karnet MPA is important in conserving a representative range of vegetation from the western margin of State Forest. This vegetation includes forests of jarrah and marri on the uplands, and forest of marri and yarri and woodland of butter gum (a species which is rare) in the valleys. Recreational activites in the area include driving, picnicking and bushwalking.

The recommended area, together with Gooralong MPA (M84), Serpentine National Park (M85) and Serpentine MPA (M87), which includes freehold land held in private ownership and by Government agencies, Land Act Reserves (including a National Park), State Forest and water catchment areas, constitutes open space of regional signficance (see Figure 1, Chapter 4). It also contributes to the larger area of regional open space extending along the Darling Scarp. The area is of regional significance because of its high conservation and recreation values and its proximity to Perth residential areas and nearby rural settlements. Not all land under the various tenures has conservation and recreation as primary management objectives and to enhance these values the management structure, together with that of M84, M85 and M87, requires coordination.

Recommendations:

M86.1 That our general recommendations on planning and management of Regional Parks be applied to this area (see Recommendations 15 and 16, Chapter 5).

M86.2 That the procedure outlined in general recommendations 1 to 5, Chapter 2, be applied to Karnet Management Priority Area.

M86.3 That the Forests Department negotiate with the Metropolitan Water Authority with a view to Cockburn Sound Location 308 being managed as if part of Karnet Management Priority Area.

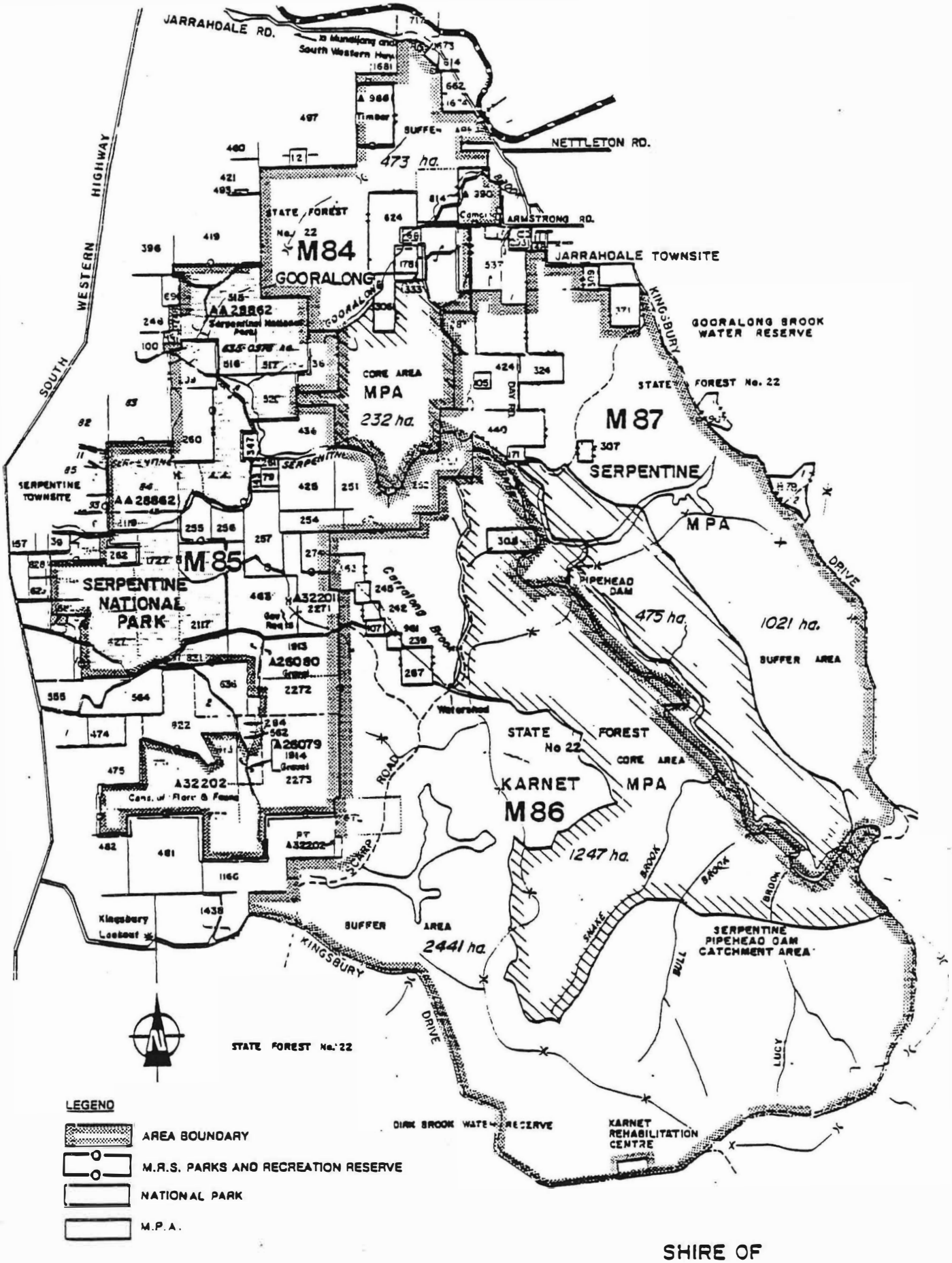
M86.4 That the portion of State Forest No. 22 adjoining the north-west of the area be managed as if part of Karnet Management Priority Area.

M87 SERPENTINE MANAGEMENT PRIORITY AREA

The recommended area is situated about 50km south-east of Perth and most of it comprises State Forest, being Serpentine Management Priority Area. The management priority as designated in the Forests Department's Working Plan No. 87 is conservation of flora and fauna. Also included in the recommended area are Cockburn Sound Locations 105, 171, 283, 307, 324, 424, 440 and part of 537, all privately owned freehold land (Figure 150).

The MPA is within the Serpentine Pipehead Dam Catchment and the Gooralong Brook Water Reserve. It may be affected by the proposed pipehead dam to be located on the Serpentine River. Public access is restricted by Catchment Zone regulations. The area is within the Alcoa Mining Lease and has short-term potential for bauxite mining.

Serpentine MPA is important in including dieback-free areas in the western portion of the jarrah forest, a region which is highly susceptible to the disease. It is also important in containing forest of yarri, jarrah and marri which elsewhere has been severely reduced in occurrence by the dam-



LANDS DEPARTMENT PUBLIC PLAN N°
JARRAHDALE TOWNSITE: 341c/40
PEEL 10,000 BG 33 5·3, 5·4, 5·5, 6·5;
DCE Ref No D10, D11, D12, D13

Figure 150

ming of valleys and clearing of land for agriculture. There are three rare plant communities within the MPA.

The recommended area, together with Gooralong MPA (M84), Serpentine National Park (M85) and Karnet MPA (M86), which includes freehold land held in private ownership and by Government agencies, Land Act Reserves (including a National Park), State Forest and water catchment areas, constitutes open space of regional significance (see Figure 1, Chapter 4). It also contributes to the larger area of regional open space extending along the Darling Scarp. The area is of regional significance because of its high conservation and recreation values and its proximity to Perth residential areas and nearby rural settlements. Not all land under the various tenures has conservation and recreation as primary management objectives and to enhance these values the management structure, together with that of M84, M85 and M86, requires coordination.

Recommendations:

M87.1 That our general recommendations on planning and management of Regional Parks be applied to this area (see Recommendations 15 and 16, Chapter 5).

M87.2 That the procedure outlined in general recommendations 1 to 5, Chapter 2, be applied to Serpentine MPA.

2. Additional Information

The three MPAs contain the following vegetation complexes: Dwellingup (H), Dwellingup (M/H), Yarragil (M/H, Min. Swamp), Yarragil (M/H, Max. Swamp), Helena (M/H), Murray (M/H), and Darling Scarp (Appendix 1, Table 1). Of these, of the greatest significance are the Murray (M/H) and Dwellingup (M/H) vegetation complexes. The former is here mildly affected by the Serpentine pipehead dam, which floods most of the valley floor, but the vegetation on the steep slopes of the valley is still in good condition and is virtually unaffected by dieback. Within the Dwellingup (M/H) complex it is chiefly the upper slopes and ridges that are still intact, though affected to various degrees by past logging. The lower slopes, and the valleys belonging to the Yarragil (M/H) complex, have been strongly affected by the dieback disease.

Jointly the three MPAs represent the largest occurrence of Dwellingup (M/H) complex, but the area is discontinuous and broken up by private property, roads and dieback infected valleys. It has been subject to logging in the past, though in some areas this has taken place of the order of a century ago, and has been relatively light. Similarly the MPAs represent the largest single contiguous area of Murray (M/H) complex within the Conservation MPAs, exceeded only by the former Recreation MPA in the

Murray Valley, which is now incorporated in the Jarrah Reserve. In terms of naturalness however, this representation is inferior to that in Eagle Hill MPA. The MPAs also represent a significant occurrence of Yarragil (M/H, Minimum Swamp) complex which, unfortunately, has been strongly affected by dieback.

In terms of timber resources, the total estimated sawlog volume (m^3) is

MPA	CORE	BUFFER	TOTAL
Gooralong	2 400	7 000	9 400
Karnet	5 864	12 376	18 240
Serpentine	6 600	14 400	21 000
Total	14 864	33 776	48 640

The timber resource is unevenly distributed within the vegetation complexes. The standing volume and productive capacity has been largely eliminated within the Yarragil complex by the dieback disease. The highest proportion of the standing volume is in the Dwellingup complex, in which jarrah is dominant. The Murray complex has a low standing volume of currently utilizable species, but has high growth potential. A prediction of likely loss of future productivity is made virtually impossible by diversity of sites and by the presence of dieback disease, as the mean annual sawlog increment ranges from 1.2 m^3/ha/year for healthy Dwellingup and Murray complexes down to zero in the case of Helena and Scarp complexes and dieback affected areas.

Within the Serpentine MPA the bauxite ore is primarily concentrated along the Serpentine-Gooralong Brook divide. In the Karnet MPA the bauxite is more broadly distributed, with peak occurrence along the Serpentine-Dirk

Brook divide. The ore reserves in the Gooralong MPA are minor. The total ore resource in the three MPAs is estimated at 85 million tonnes.

The three MPAs are of major importance in the development of water resources. The eastern boundary of both the Serpentine and the Karnet MPA was determined by the main Serpentine storage dam and most of their joint boundary has been inundated by the Serpentine pipehead dam. Further dams are planned downstream from the pipehead dam or alternatively on the Gooralong Brook and this would have an impact on the remaining valley vegetation types. The runoff per hectare is high due to high rainfall, steep topography and reduction of cover by dieback.

Conflict Zones

The Gooralong MPA, though containing some bauxite ore, is considered a zone of low conflict by Alcoa. There is no disagreement on the cores of the Serpentine-Karnet MPAs, which in the earlier review were considered to be of low conflict by Alcoa, and of high conservation importance by the Forests Department. Similarly the conflict was low in the outer buffers which drain away from the core, and which for the most part are infected by dieback. The main difficulty confronted by the Committee was to reach accord on the most desirable designation for those parts of the buffers within the lower Serpentine catchment which drain towards the cores. Here the ore values are high and the upland vegetation varies markedly from vigorous high quality forest to areas reduced to scattered individual trees of marri and highly depauperized understorey.

Proposals

Bearing all factors in mind, the following recommendations are made. The entire Gooralong MPA, including both core and buffer, be designated as a Conservation reserve. In the Serpentine MPA, mining is proposed to be permitted in all areas of the former buffer draining away from the core,

with the exception of the north-easternmost portion adjacent to Jarrahdale townsite, which still contains a healthy example of the forest which type elsewhere has been largely decimated by dieback. The central portion of the buffer that drains towards the core and is heavily infected by dieback, is proposed for mining with the specification that mining should not proceed until it has been demonstrated that it can be carried out without de-stabilising vegetation complexes which occur downslope and within the core.

In the Karnet MPA mining is proposed in the south-eastern portions of the buffer which drains away from the core. It is also to be proposed in the south-western portion of the buffer drained by Karnet Brook. In the eastern part of the buffer draining towards the core mining is proposed with the proviso that it can be carried out without destabilising the vegetation of the core. It is proposed that mining be excluded from the core of the MPA and the southward extension of the reserve to Kingsbury Drive. However there will be a need to provide for right of way for a conveyor through the dieback-affected depression between them.

It is proposed that mining also be excluded from the western portion of the buffer where the ore bodies are small and widely dispersed.

The precise location of the relevant areas is given in the attached map.

Consequences of the Proposals

If the proposals are enacted, the MPAs comprising three cores and three buffers and totalling 57.87 km^2 will be altered to form a reserve of area 39.77 km^2. The effect of this on the various land uses will be as follows:

a) Conservation of Flora and Fauna

The proposed modifications of the boundaries will result in increased

security for those parts of the buffer not recommended for excision. If the proposals are enacted, the considerable reduction in the area of the former buffer will have a relatively minor impact, as the bulk of these areas are already heavily infected by dieback. The three vegetation complexes which would be most affected in the short term are the Dwellingup (H), Dwellingup (M/H) and Yarragil (M/H Minimum Swamps). The representation of these three complexes will be reduced in terms of area by 2.76 km^2, 8.98 km^2 and 5.24 km^2 respectively. In the long term the proposal could result in the destabilisation of the Murray complex, and it is for this reason that conditions applicable to mining in parts of the former buffer areas have been included in the recommendations. Yarragil (M/H Maximum Swamps), which originally occupied 0.59 km^2, would be eliminated. The representation of the various vegetation complexes is listed in Appendix 1, table 1.

b) Bauxite Mining

The proposed reserve includes several large ore bodies estimated to contain in total about 45 million tonnes of ore. However, from the previous core and buffer areas about 40 million tonnes of ore scheduled for mining within 15 to 25 years in Serpentine, and 25 to 50 years in Karnet, will be made accessible for extraction if the proposals are accepted.

c) Timber Industry

The proposed reserve is estimated to contain 34 931 m^3 of sawlog timber primarily of jarrah, but with a significant proportion of yarri (WA Blackbutt). This is 3179 m^3 more than was estimated in the 1977-1982 General Working Plans for these MPAs. As already mentioned, no reliable estimate of future increment is possible.

d) Water Supply

The proposal to allow the mining of the dieback-infected buffer

draining towards the core may generate turbidity problems. The core consists of a relatively narrow zone one or two kilometres wide on either side of the pipehead dam, and in its present form provides a reasonable filter against turbidity. Mining in the buffer can be expected to increase turbidity yet the most obvious means of preventing this, that is, the ponding of the water at the lower boundary of the mining pit would, on past experience, aggravate the destabilisation of the vegetation of the core. In order to accommodate the two conflicting objectives, mining and rehabilitation methods need to be developed which will rapidly shed water from the mined area without raising turbidity to unacceptable levels. The pipehead dam runs along the bottom of the valley and consequently cannot affect the integrity of the reserve which it already effectively separates.

Development of pipehead dams on either the lower Serpentine river or Gooralong Brook, would lead to a little inundation of the vegetation of those valleys. Pipeline corridors from either of these dams to Serpentine Main Dam will be required through the reserve.

THE PLAVINS MPA

1. The summary of this MPA's attributes, and of the relevant recommendations made by the System 6 Report, are given below.

C74 PLAVINS MANAGEMENT PRIORITY AREA

The recommended area is situated about 5km south-east of Dwellingup and comprises State Forest, being Plavins Management Priority Area. The management priority as designated in the Forests Department's Working Plan No. 87 is conservation of flora, fauna and landscape (Figure 53).

The MPA is within the Murray River Water Reserve, a potential water supply source. Part of the MPA will be inundated if a major dam is built on the Murray River or if smaller dams are built on Swamp Oak, Davies or Yarragil Brooks. The area is within the Alcoa Mining Lease and has considerable potential for mining in the medium term. Widening of the Pinjarra-Williams Road may affect the area.

Plavins MPA conserves a range of vegetation typical of the higher rainfall area of the western fringe of the Darling Range, including a large area of high-quality open-forest of jarrah and marri. It also contains, along Swamp Oak Brook, an extensive stand of river banksia, a species which occurs only in localised patches in this higher rainfall area and is endangered by flooding and dieback. The vegetation types of the Murray Valley, one of the last major valleys not yet flooded for water supply, are well represented.

The recommended area together with Teesdale MPA (C72), Murray Valley MPA (C73), Samson MPA (C75), Federal MPA (C76), Bell MPA (C77), Surface MPA (C82), Nalyerin MPA (C83), Trees

MPA (C84) and Stene MPA (C85), which includes private and Government freehold land, Land Act reserves and State Forest, constitutes open space of regional significance (see Figure 1, Chapter 4). The area is of regional significance because of its high conservation and recreation value and its proximity to the Perth and Bunbury regions and neighbouring rural districts. Not all land under the various tenures within the area has conservation and recreation as primary management objectives: to enhance these values the management structure for this area, together with that for C72, C73, C75-C77 and C82-C85, requires coordination.

Recommendations:

C74.1 That our general recommendations on planning and management of Regional Parks be applied to this area (see Recommendations 15 and 16, Chapter 5).

C74.2 That the procedure outlined in general recommendations 1 to 5, Chapter 2, be applied to Plavins MPA.

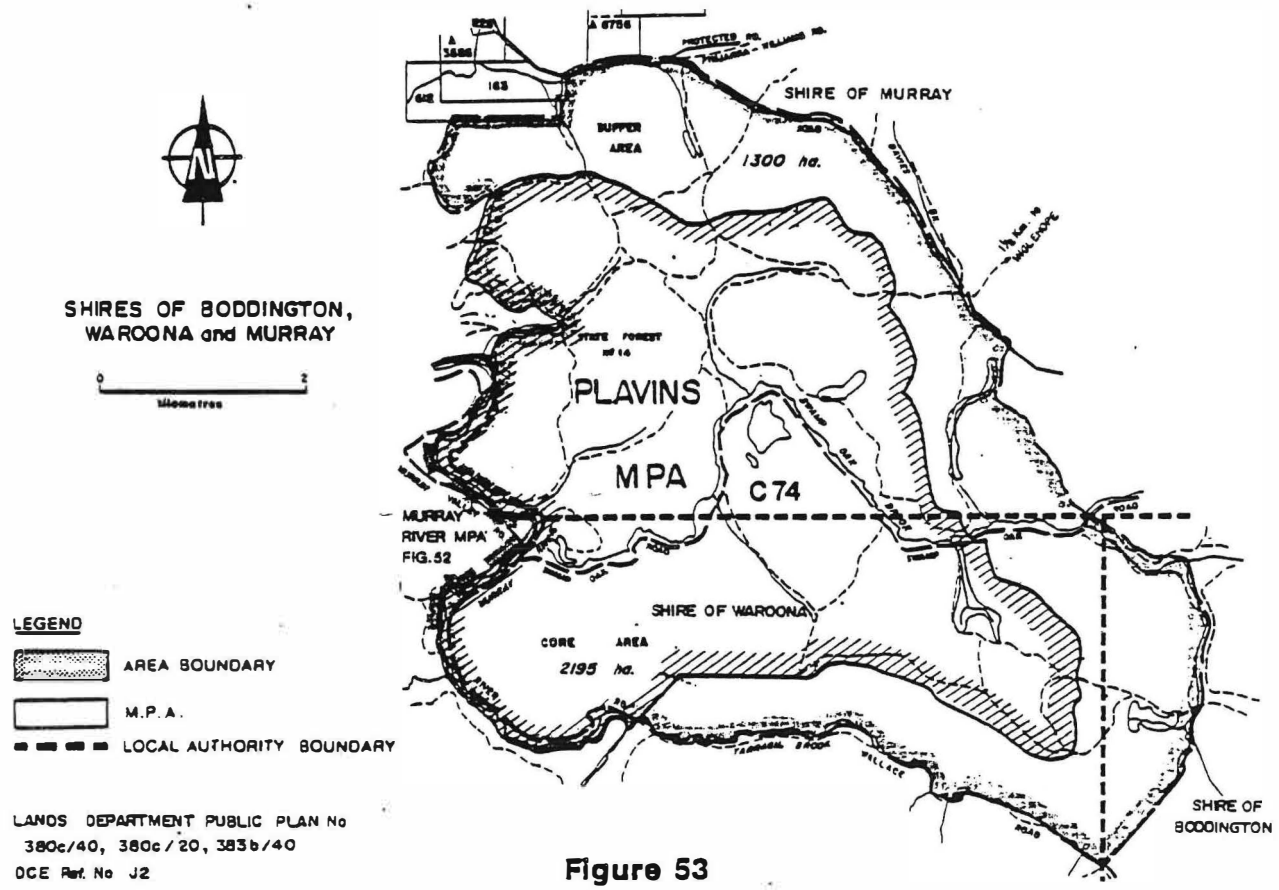


Figure 53

2. Additional Information

The above information can be supplemented by that contained in the report on Land Use in the Darling Ranges. Plavins MPA contains Dwellingup (H), Yarragil (M/H Minimum Swamps), and Murray (M/H) vegetation complexes.

Of these, of greatest significance is Yarragil which contains outstanding development of Banksia litoralis var. seminuda. However the Dwellingup (H) is also very important, as this is the vegetation complex which occurs in the areas of forest where much of the current mining is taking place.

In terms of timber resources the MPA has been estimated to contain 32 200 m^3 of sawlog timber in the core and 19 000 m^3 in the buffer, a total of 51 200 m^3. Alcoa has indicated that about 60 million tonnes of bauxite ore occurs in the area and that the ore is exceptionally good in quality and quantity, in both the core and in the buffer. The MPA contains the bulk of the Swamp Oak Brook catchment. This tributary of the Murray, has an estimated water yield of 2.5 million m^3yr^{-1}, and is under consideration as a possible source of potable water for the Metropolitan area. Parts of the buffers of the MPA are in the Yarragil and Davies Brook catchments, both of which have also been considered as water sources for the Metropolitan area. The damming of the Swamp Oak Brook would have a major impact on the Murray and Yarragil vegetation complexes within the MPA, but a pipehead dam could eliminate this impact. Damming the Yarragil Brook would only affect part of the buffer. The damming of the Davies Brook would have no effect.

3. Conflict Zones

In Plavins MPA the conflicts between potential resource uses are severe as the area contains high grade reserves of bauxite ore and healthy and relatively fast-growing stands of jarrah and yarri. It yields high quality water and along its southern boundary is heavily utilised for water-based recreation.

In the earlier Forests Department and Alcoa review, the northern buffer draining into the Davies Brook bordering onto farms and plantations, and containing some occurrences of dieback, was defined as being a zone of lower conflict by the Forests Department. The remainder of the MPA was defined as a zone of high conflict. After field inspections and the Committee offers the following proposals.

4. Proposals

It is proposed that the northern buffer (Conflict Zone 1) and the adjacent portion of the core not draining into Swamp Oak Brook, be released for mining and timber recovery and that the remainder of the MPA be designated for conservation and be added to the Murray Valley Jarrah Reserve.

5. Consequences of the Proposals

The status of the former MPA would be altered from a core and buffer of total area 34.92 km^2 to a Reserve of 29.09 km^2. The Reserve will be contiguous with the previously announced Murray Valley Jarrah Reserve. The effect of the excision on the various land uses will be as follows:

a) Conservation of Flora and Fauna

The risk of dieback introduction into the core, which would seriously endanger the Yarragil (M/H Minimum Swamp) complex would be reduced by exclusion of even partial logging from all the portions of the buffer draining into the Swamp Oak Brook. The Dwellingup (H) complex would retain a higher degree of structural integrity and be less at risk than if the former buffer was selectively logged.

However, the representation of the vegetation complexes will be reduced:

Yarragil (M/H Minimum Swamp) by 1.21 km^2

Murray (M/H) by .73 km^2

Dwellingup (H) by 3.89 km^2

The northern buffer would be eliminated and the risk of accidental introduction of dieback into the core of the area would be correspondingly increased. The contiguity relationship with the Jarrah Reserve and the area to boundary ratio would be basically unchanged.

b) Bauxite Mining

Several very large ore bodies estimated to contain about 40 million tonnes of ore would be included within the reserve. About 20 million tonnes of ore scheduled for mining within the 25-50 year period would be made available for extraction.

c) Timber Industry

The proposal will remove from potential production an estimated 43 040 m^3 of sawlog timber. The additional loss to the timber industry over and above that designated for the Plavins area in the 1982 General Working Plan is 1 340 m^3. In view of the high quality of the bulk of the forest and the relative freedom from dieback, the estimated loss in terms of annual growth increment is between .8 and 1.2 m^3 per hectare per annum, that is approximately 3 000 m^3 per year overall.

d) Water Supplies

The effect of the proposal is likely to be a short term increase in water yield, and a corresponding increase in turbidity of the Davies Brook during mining and early stages of rehabilitation. There should be no change in vegetative cover of the Swamp Oak Brook and Yarragil Brook catchments. The water supply potential of the Murray River basin would not be seriously

reduced if a pipehead type development on Swamp Oak Brook is established and pipeline corridors are allowed in these reserves.

e) Recreation

In view of the vulnerability of the Yarragil complex to dieback disease, motorised recreation should be confined to existing major roads, eg the Marradong Road, Murray Road and Yarragil Formation.

THE LENNARD MPA

1. The summary of this MPA's attributes, and of the relevant recommendations made in the System 6 Report, are given below.

C87 LENNARD MANAGEMENT PRIORITY AREA

The recommended area is situated about 18km west of Collie and most of it comprises State Forest, being Lennard Management Priority Area. The management priority as designated in the Forests Department's Working Plan No. 87 is conservation of flora, fauna and landscape. Also included in the recommended area is Reserve C19641, for School Site, not vested (Figure 60).

The area has been used for army training. It would be affected in part by construction of a dam on the Collie River at Burekup, in which case Catchment Zone regulations would restrict public access. PWD pipelines affect the area. Realignment of the Roelands-Lake King Road may also affect the area. It is within the Alcoa Mining Lease but has relatively low long-term potential for bauxite mining. The Collie River and land adjacent to it is within the boundaries of responsibility of the Leschenault Inlet Management Authority.

The characteristic vegetation of this western high rainfall area is forest of yarri, jarrah and marri. An outstanding feature of the MPA is the good representation of yarri, peppermint and river banksia whose occurrence elsewhere has been eliminated or reduced by damming of rivers, agricultural clearing and pine plantations.

The Lower Collie Valley provides a valuable recreation area for people from the Collie-Bunbury area, and its terrain, river bed and fringing vegetation are particularly attractive. Recreation use of the area is fairly extensive and includes canoeing, marroning and trailbike riding, with some bushwalking. Some footpaths and scenic drives have been constructed.

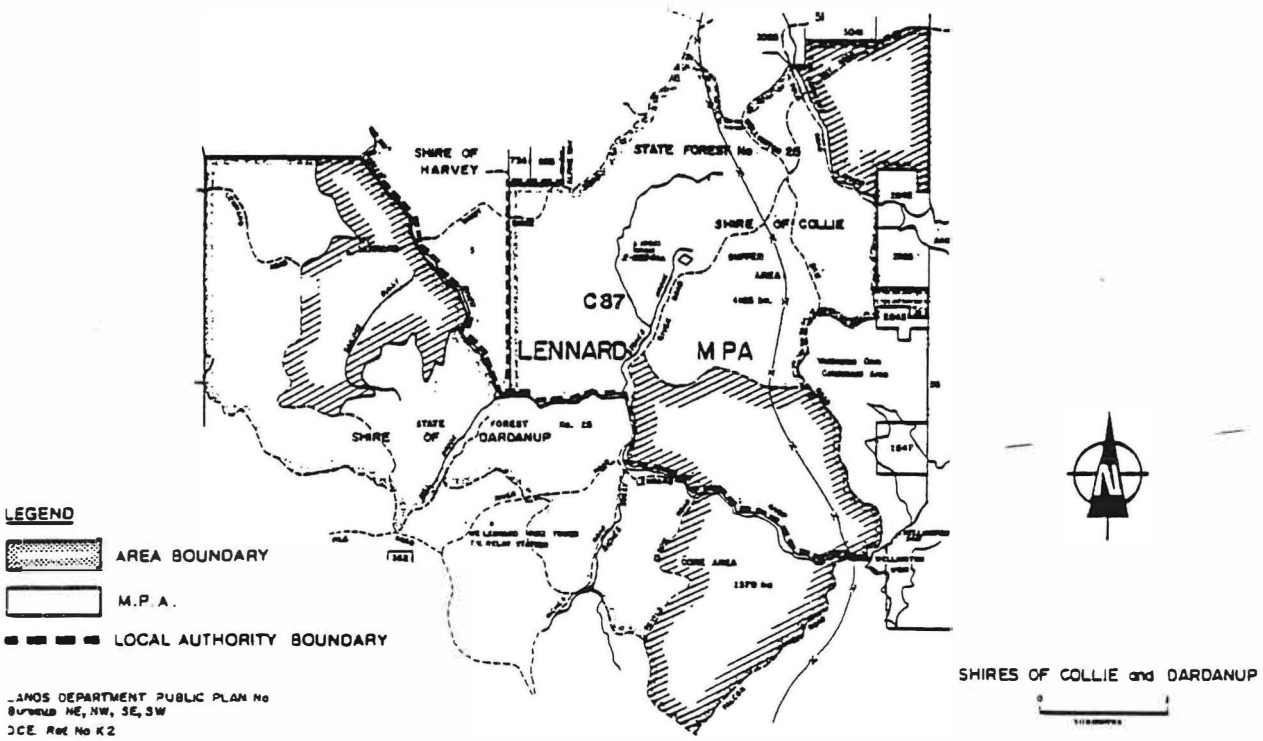
The area contributes to open space of regional significance along the Lower Collie Valley (see Figure 1, Chapter 4) because of its conservation and recreation value and its proximity to the Bunbury and Collie regions.

Recommendations:

C87.1 That our general recommendations on planning and management of Regional Parks be applied to this area (see Recommendations 15 and 16, Chapter 5).

C87.2 That the procedure outlined in general recommendations 1 to 5, Chapter 2, be applied to Lennard MPA.

C87.3 That Reserve C19641 be cancelled and its area added to State Forest to be managed as part of Lennard MPA.



2. Additional Information

The above information can be supplemented by that contained in the Report on Land Use in the Darling Ranges, and from information made available by the Forests Department. The Lennard MPA contains the following vegetation complexes in buffer and core: Helena (M/H), Dwellingup (H), Murray (M/H), Yarragil (M/H), Darling Scarp and Lowdon (Appendix 1, Table 1). Of these the Helena complex is of greatest importance by far as this is the only MPA in which it is adequately represented. The Helena complex is very diverse, ranging from moss fields through herb fields and shrublands to woodland and valley forest of yarri, marri and peppermint.

Of lesser importance, but still of high significance is the relatively large occurrence of Dwellingup (H) complex, the second best representation of this type within the proposed or designated reserves, which in all the MPAs to the north is the vegetation complex in which the conflict between bauxite mining and conservation and timber production is greatest. The Darling Scarp complex, though relatively sparsely present is of high significance as elsewhere the occurrences are almost entirely on private land, and strongly modified by grazing and fire. The remaining complexes, whilst representing useful additional occurrences, are better represented in other MPAs, and are therefore of lesser importance.

In terms of timber, the MPA contains 102 300 m^3 of sawlog, 30 900 m^3 is in the core and 71 400 m^3 is in the buffer. The bauxite ore that occurs within the MPA is of lower density and quality than ore occurring further north, and currently is distant from the nearest refinery at Wagerup. The valley of the Collie River is under consideration for development of water resources by the Public Works Department. The alternatives to be considered are a pipehead dam, which would have relatively minor impact, and a major storage dam at Burekup, which would flood a considerable proportion of the Helena complex. It is understood that a decision to establish a major dam

may be 50 years or more ahead, and that the problem of salinity within the catchment will have to be resolved before the Burekup Dam could be seriously considered.

The area is valuable due to its outstanding aesthetic values and the existence of year round fresh water flows from the Wellington Dam to the irrigation channels. It is subject to heavy recreational use and it appears that in some of the most favoured spots there may be some deterioration due to over use.

3. Conflict Zones

The clearest conflict in the short term is that between values for conservation and for timber extraction. The volume of timber contained in the MPA is high, some portions of the MPA, where fertile and deeper soils are present, are highly productive.

Further potential influence of the area is the proposed construction of dams within or below the MPA in the longer term.

Another aspect of conflict, is that between conservation and recreation, which can be expected to intensify as the Collie-Bunbury region is further industrialised and as the local population increases.

4. Proposals

As the core of the MPA is a valley, and as all the buffer areas slope towards the core, it is difficult to propose any excisions for resource recovery, despite the recognised heavy impact on the timber industry that will occur by conversion of the MPA to a conservation reserve. In addition the area at the extreme northwest tip of the MPA drains into the only sizeable occurrence (3.01 km^2) of Scarp vegetation complex in the MPA system. It is therefore proposed that the entire MPA be designated a Conservation Reserve, and that an appropriate management programme be

urgently developed to cope with the recreational pressures and with the presence of dieback on the periphery of the area.

5. Consequences of the Proposals

The status of the MPA would be changed from a core of approximately 24 km^2 and a buffer of 42 km^2 to a reserve of core status and total area of 66 km^2. The effect of the excision on the various land uses will be as follows:

a) Conservation of Flora and Fauna

The exclusion of logging from the previously designated buffer areas would reduce the risk of dieback introduction into the core and retain the structural integrity of the existing stands. As a considerable proportion of the buffer is of the Dwellingup (H) complex, it would have a compensatory effect for excisions for bauxite mining recommended for the northern MPAs.

b) Bauxite Mining

There would be no significant impact on bauxite mining.

c) Timber Industry

The formation of the reserve would remove from potential production 102 300 m^3 of sawlog timber. This would represent an additional loss over and above that included in the 1982 General Working Plan of 35 700 m^3 of timber. In view of the enormous variability in productivity of the Helena complex, it is not possible to make a reliable estimate of loss in terms of annual increment.

d) Water Supplies

Although designation of the area as a major conservation asset and

recreation resource could, when the construction of dams is being contemplated, generate public reaction, it could be pointed out that proclamation of the reserve does not infer priority over development of water resources where these are seen to be of key importance to the State. In return, planning of major dams should take the high conservation and recreation value of the area into consideration.

e) Recreation

In view of the already visible adverse effect of recreation on the more vulnerable parts of the Helena surface, recreation should be controlled so as to minimise its impact.

PRESTON AND NOGGERUP MPAs

The two MPAs are dealt with jointly because they are contiguous and share many characteristics such as the proximity to farming country, and presence within them of vegetation complexes largely eliminated elsewhere by agricultural clearing. The summary of the attributes of the two MPAs, together with relevant recommendations made by the System 6 Report are given below:

C90 PRESTON MANAGEMENT PRIORITY AREA

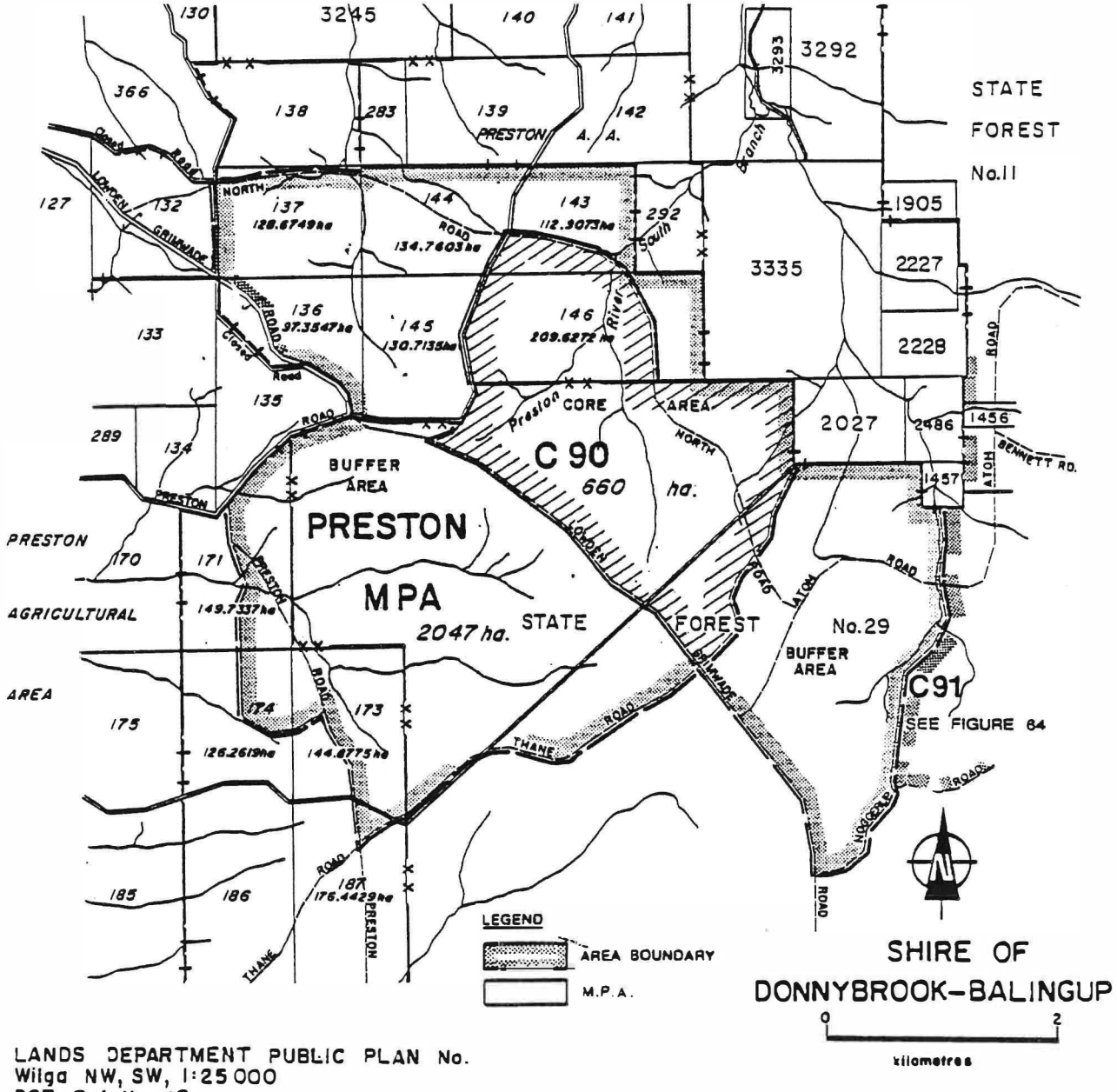
The recommended area is situated about 30km south of Collie and comprises State Forest, being Preston Management Priority Area. The management priority as designated in the Forests Department's Working Plan No. 87 is conservation of flora, fauna and landscape (Figure 63).

The MPA is within the Alcoa Mining Lease but has relatively low long-term potential for bauxite mining.

Most of the area consists of lateritic uplands covered by open-forest of jarrah and marri with an understorey containing bull banksia, snottygobble, sheoak, tassel flower and zamia. Valley vegetation comprises mainly open-forest of yarri, marri and jarrah with an admixture of peppermint and flooded gum. The most important feature of the MPA is a substantial area of uncut jarrah forest in the north-east corner.

Recommendation:

C90.1 That the procedure outlined in general recommendations 1 to 5, Chapter 2, be applied to Preston MPA.



LANDS DEPARTMENT PUBLIC PLAN No.
Wilga NW, SW, 1:25 000
DCE Ref. No K8

Figure 63

C91 NOGGERUP MANAGEMENT PRIORITY AREA

The recommended area is situated about 25km south of Collie and most of it comprises State Forest, being Noggerup Management Priority Area. The management priority as designated in the Forests Department's Working Plan No. 87 is conservation of flora, fauna and landscape. Also included in the recommended area is Reserve 17114, for Railway Water Supply, not vested (Figure 64).

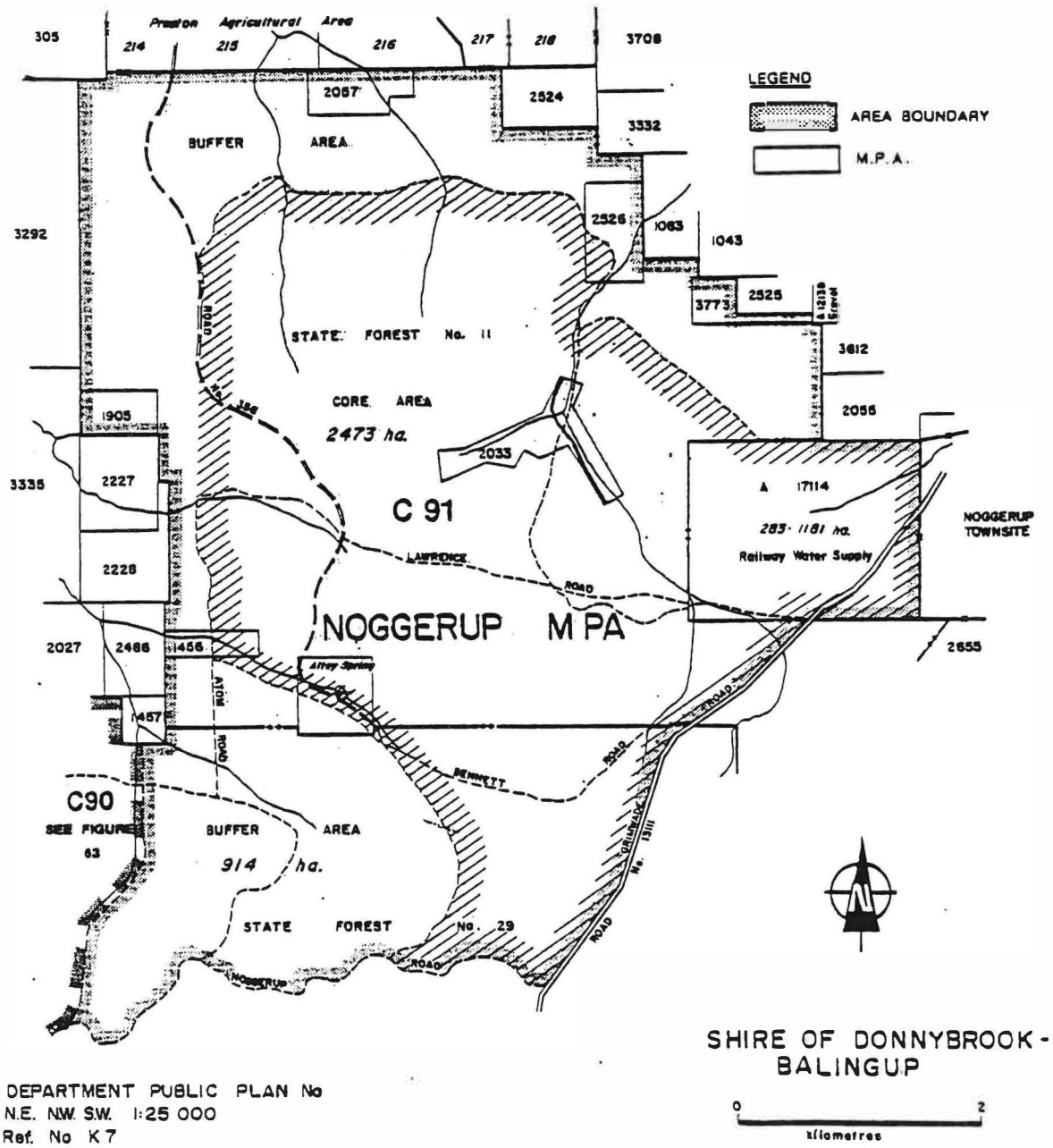
The area is within the Alcoa Mining Lease but has relatively low long-term potential for bauxite mining. The area also has potential for tin and tantalite.

The vegetation in Noggerup MPA consists primarily of open-forest of yarri, marri and jarrah, with an admixture of peppermint and flooded gum in the moister gullies. An important feature of the MPA is the woodland of swamp banksia which occurs on the valley floors.

Recommendations:

C91.1 That the procedure outlined in general recommendations 1 to 5, Chapter 2, be applied to Noggerup MPA.

C91.2 That Reserve C17114 be cancelled and its area added to State Forest to be managed as part of Noggerup MPA.



LANDS DEPARTMENT PUBLIC PLAN No
Wilga N.E. N.W. S.W. 1:25 000
D.C.E. Ref. No K 7

Figure 64

2. Additional Information

The two MPAs contain the following vegetation complexes: Dwellingup (H), Wilga, Catterick (M/H) and Lowdon (Appendix 1, Table 1). Of these the Catterick (M/H) complex and Lowdon complex are of greatest significance. Both of these occur primarily outside State forest. Part of the Dwellingup (H) complex in the Preston MPA, has not been disturbed by logging. In addition, there is a small occurrence of the Wilga complex, which occurs more extensively in the area covered by the Worsley lease.

The occurrence of dieback in the area is confined to isolated infections and some linear spread along watercourses. The bulk of the area is as yet unaffected. Both MPAs are within the quarantine zone.

In terms of timber resources the two areas are estimated to contain 101 700 m^3 of sawlogs, half of which is contained in the buffers.

Although laterite occurs within the area, there is little bauxite ore and the area is of little interest to Alcoa.

The two MPAs drain partially northwards into the Preston river, which is currently harnessed for irrigation, and partially southwards into the Blackwood river which is not harnessed. As the areas are high in the landscape, there is little likelihood of any conflict with future dam construction.

Because the areas are in quarantine and away from major roads, there is little or no recreation pressure.

3. Conflict Zones

As the area is of low interest to Alcoa there is no conflict in regard to bauxite mining. There is however a very high conflict between conservation and timber extraction as the two MPAs contain relatively high standing volumes of sawlogs and also have high timber growth potential, accompanied by freedom from dieback.

Both the core and the buffer of Noggerup MPA should become a conservation reserve as the buffer forms a barrier between the core and the surrounding farming country. That small portion of the buffer in the south east of the MPA which does not fall into this category is to a large degree comprised of Catterick and Lowdon vegetation complexes which are inadequately represented in other MPAs. In addition this area provides a link with the Preston MPA. In the Preston MPA there are two small catchments draining away from the core. Again these largely consist of the Catterick and Lowdon complexes.

4. Proposals

It is proposed that the Preston and Noggerup MPAs be designated as conservation reserves in their entirety. In view of the large proportion of the perimeter which is cleared farming country and serves as a source of fire risk and weed invasion, appropriate management strategies will need to be developed to protect the reserves.

5. Consequences of the Proposals

The status of the MPAs would be altered from two cores of 3133 hectares and two buffers of 2961 hectares, to a reserve of 6094 hectares (61 km^2).

a) Conservation of Flora and Fauna

The exclusion of logging from the buffers would minimise the risk of introduction of dieback and would preserve the structural integrity of the vegetation.

b) Bauxite Mining

No appreciable consequences.

c) Timber Industry

The reserve would result in the withdrawal from production of an estimated 101 700 m^3 of timber, primarily jarrah. This is 24650 m^3 more than provided for in the 1977 and 1982 General Working Plans where access to some timber in the buffer was envisaged. The annual sawlog growth increment foregone is estimated to be 6000 m^3 to 7000 m^3 per annum.

d) Water Supply

There are probably no beneficial or negative consequences of assigning the two MPAs as conservation reserves as there is basically no change of hydrological status. In any case, the two MPAs represent only a small portion of the Preston catchment and are separated from the stream line by extensive agricultural clearing.

MULLALYUP MPA

1. The summary of this MPA's attributes, and of the relevant recommendations made by the System 6 Report, are given below:

C95 MULLALYUP MANAGEMENT PRIORITY AREA

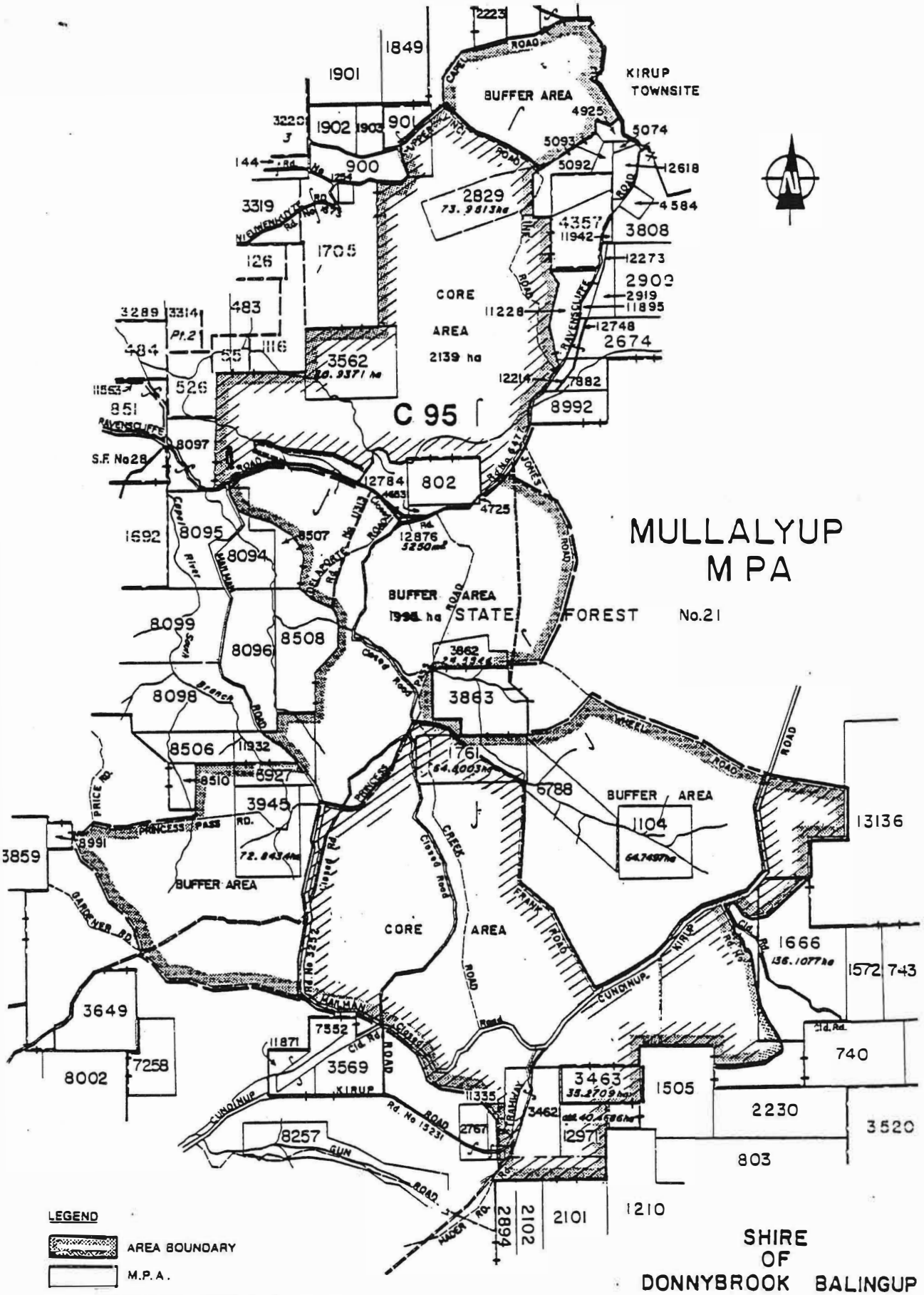
The recommended area is situated immediately south of Kirup and most of it comprises State Forest, being Mullalyup Management Priority Area. The management priority as designated in the Forests Department's Working Plan No. 87 is conservation of flora, fauna and landscape. Also included in the recommended area are Location 3463 and part of Location 1666, freehold land held in the name of the Conservator of Forests; and Locations 802, 4653 and 12784, privately owned freehold land (Figure 67).

The area may be affected by future requirements for the South Western Highway. The PWD may wish to establish a benchmark catchment within the MPA. It is within the Alcoa Mining Lease, but has little significance for bauxite mining.

The MPA includes a range of soils, landforms and vegetation characteristic of the high rainfall areas of the western fringes of the Darling Range. Shallow depressions associated with lateritic surfaces occur in the MPA and are significant since these are mainly confined to the central and northern part of the Range. The lateritic uplands support open-forest of jarrah and marri, with understorey species that reflect the area's high rainfall. There is a variety of vegetation, including significant extensive stands of yarri and river banksia, and areas of heath on the granitic outcrops in the eastern section.

Rapids, together with the granitic outcrops and heath, give the area aesthetic appeal. It has not been used extensively for recreation in the past, but the Bibbulmun Track passes through the north-west section and will attract more people into the area.

The area contributes to open space of regional significance because of its high conservation and recreation value along the Blackwood River Valley and Balingup Brook (see Figure 1, Chapter 4).



LANDS DEPARTMENT PUBLIC PLAN No.
414D /40 Kirup Townsite
DCE Ref. No K11

Figure 67

Recommendations:

C95.1 That our general recommendations on planning and management of Regional Parks be applied to this area (see Recommendations 15 and 16, Chapter 5).

C95.2 That the procedure outlined in general recommendations 1 to 5, Chapter 2, be applied to Mullalyup MPA.

C95.3 That the freehold land held in the name of the Conservator of Forests be managed as if part of Mullalyup MPA.

The Mullalyup MPA is extremely diverse and contains the following vegetation complexes: Dwellingup (H), Gunaping, Yarragil (L/M), Bridgetown (M/H), Balingup (M/H) and Lowdon (see Appendix 1, Table 1). The Bridgetown and Balingup complexes are not represented in any of the MPAs within ML1SA considered earlier and the Lowdon complex is represented only in Preston and Noggerup.

There is no detailed data available on the total extent of the occurrence of these vegetation complexes, the adequacy of representation has had to be assessed from the observation of dominant plant species. As far as can be judged from geomorphology, the bulk of the vegetation of this type has been cleared for grazing, orchards and pine plantations and the Mullalyup MPA is therefore of particular importance as the only remnant of these vegetation complexes set aside for conservation. There are already considerable occurrences of dieback on the periphery of the area, but key vegetation complexes remain largely unaffected.

3. Conflict Zones

The lateritic residuals within the MPA are small and isolated. There is no indication that they contain bauxite of commercial value, and the area is of low interest to Alcoa. The main conflict within the area is therefore between conservation and timber production.

The MPA contains 51 100 m^3 of sawlogs, almost equally divided between core and buffer. The area is drained by the Capel and Blackwood Rivers, neither of which is harnessed for irrigation but may be of some future consequence for water supplies to neighbouring small townships such as Kirup and Balingup. In view of its proximity to Kirup, the MPA is used for local recreation and the Bibbulmun track, which passes through it, attracts some additional outside use.

The MPA is comparatively small in area and is almost entirely surrounded by private property, and therefore the scope for any excision of areas for viable timber production units is very limited. It seems likely that if the present knowledge of vegetation complexes had been available prior to 1977, then the whole MPA because of its uniqueness would have been classed as core in the General Working Plan.

4. Proposals

It is proposed that the entire MPA be designated for conservation. In view of the very high proportion of the boundary that consists of private land, special management provisions would be needed to ensure its long term survival.

5. Consequences of the Proposals

The status of the MPA would be altered from a core of approximately 21 km^2 and buffer of 20 km^2 to a reserve of 41 km^2. The perimeter to area ratio is very high, and this is an adverse feature which will require effective management of the area.

a) Conservation of Flora and Fauna

The proposed modification of the status of the MPA will result in

increased security of the areas formerly classed as buffer. Even so, the key vegetation complexes within the Reserve are probably still inadequately represented overall.

b) Bauxite Mining

Little effect.

c) Timber Industry

The volume of timber in the proposed reserve is estimated to be 51 100 m^3 of sawlogs. This is 11 700 m^3 more than provided for in the 1982 General Working Plan. In view of the high vegetation diversity of the area, ranging from bare rock and heathland to very productive high forest, no reliable assessment of growth potential is possible.

d) Water Supply

The designation of the area for conservation would have no significant effect on water resources of the region.

Appendix 1. Table 1. Areas included in the Jarrah Reserve or proposed to be designated as Conservation Reserves that are contained within the FMIS data base of Vegetation Complexes (km^2)

(This table does not include Trees Extension on which boundaries are yet to be defined. The area involved in Trees Extension is quite small in relation to those listed here.)

Vegetation Complex	Bell	Cooke	Dale	Eagle Hill	Federal	Gooralong	Karnet	Lennard	Mullalyup	Nalyerin	Noggerup	North Dandalup	Plavins	Preston	Randall	Samson plus Connector	Serpentine	Serpentine National
Dwellingup (H)*	1.75				3.92		0.53	21.83[2]	14.67		12.60	1.01	11.30[3]	13.20		2.62		
Dwellingup (M/H)*	5.48	17.09[2**]	3.39[3]	11.33[3]		3.94	6.66			5.97[2]					8.77		8.24	3.96
Dwellingup & Yalanbee (L/M)*	2.40	4.06[2]	21.47[3]							39.12[2]								
Cooke*		11.64[2]	3.84	4.97	0.24										7.22			
Goonaping*									1.91	10.46								
Wilga (L/M)	0.45										4.00							
Yarragil Minimum Swamps (M/H)*					3.68[3]		0.81	3.82	6.18			0.20	11.11[1]			10.32[2]		0.24
Yarragil Maximum Swamps (M/H)*	1.34		12.01[2]	3.27						4.87					3.70			
Swamp*		7.59	2.84	2.03						11.70					0.19			
Pindalup/Yarragil (L/M)*	0.81	13.74	8.47							30.61					2.22			
Helena (M/H)*						1.26[3]		30.71[1]				0.49						3.39
Murray (M/H)*	8.47			15.30[1]	5.87	1.64	12.73[2]	6.26				0.30	6.68[3]				3.78	0.79
Murray (L/M)*	7.53[2]		18.52[1]															
Lowdon	3.05							0.41[2]	9.93[1]		8.50			9.20[2]				
Darling Scarp						0.04	0.14[3]	3.07[1]				0.28[2]						0.14
Catterick	1.16[3]										8.90[1]			4.60[2]				
Bridgetown									1.85[1]									
Balingup (M/H)									5.91[1]									
	32.44	54.12	70.54	36.90	13.71	6.88	20.87	66.10	40.45	102.73	41.00	2.28	29.09	27.00	22.10	12.94	12.02	15.88
Approximate quantity of bauxite (M tonnes)	10	5	10	10	15	<5	30	<5	<5	5	<5	<5	40	<5	5	15	15	<5

* Vegetation complexes whose major expression is found within the region where MLISA overlays with the FMIS vegetation complex data base

Stirling Dam	Surface	Teesdale	Trees	Windsor	Wungong	Total	Area within FMIS data base	%	
0.65	22.38[1]	4.43[2]				110.89	2427.81	4.57	Dwellingup (H)*
	12.21[1]		7.45[1]	3.09	0.71	98.29	701.72	14.01	Dwellingup (M/H)*
	0.32		27.75[1]	0.12[3]		95.24	1132.91	8.41	Dwellingup & Yalanbee (L/M)*
				12.13[3]		40.04	215.42	18.59	Cooke*
	23.78[2]		4.71			40.86	173.89	23.50	Goonaping*
						4.45	377.53	1.18	Wilga (L/M)
	0.60[1]	0.51		4.53		42.00	873.13	4.81	Yarragil Minimum Swamps (M/H)*
	37.82[1]		9.04[3]		0.49	72.54	700.66	10.35	Yarragil Maximum Swamps (M/H)*
	17.24[2]		4.31[1]	4.00		49.90	459.26	10.86	Swamp*
	2.62		19.93[1]	18.60		97.00	1857.66	5.22	Pindalup/Yarragil (L/M)*
		11.76[2]				47.61	169.97	28.01	Helena (M/H)*
2.68		0.37			1.02	65.89	756.99	8.84	Murray (M/H)*
						26.05	337.27	7.72	Murray (L/M)
						34.62	630.43	5.49	Lowdon
						3.67	397.03	0.09	Darling Scarp
						14.66	354.62	4.13	Catterick
						1.85	393.98	0.05	Bridgetown
						5.91	44.14	13.39	Balingup (M/H)
3.33	116.97	17.07	73.19	42.47	2.22	862.30	17983.65	4.79	
<5	25	<5	<5	10	<5	200			

Additions to conservation reserves (not including the Murray River Reserve and Serpentine National park) total 477.39 km^2

** Superscript number represents 1st, 2nd and 3rd best representation of type

ppendix 1. Table 2. Areas proposed to be added to (+) and excised from (-) MPAs classified by Vegetation Complex (km^2)

Vegetation Complex	Cooke		Dale		Eagle Hill	Karnet	Plavins	Randall	Serpentine	Total	Total Within DRSG Area	%
	+	-	+	-	-	-	-	+	-			
Dwellingup (H)						2.76	3.89			-6.65	1529.96	-0.43
Dwellingup (M/H)	7.09	3.43			3.58	7.27		8.77	1.71	-0.13	670.60	-0.02
Dwellingup and Yalanbee (L/M)			5.71	3.43						+2.28	1060.78	0.21
Cooke	0.40	0.46			1.55			7.22		+5.61	215.20	2.61
Yarragil Minimum Swamps (M/H)			1.51			5.24	1.21	3.70			781.52	-0.16
Yarragil Maximum Swamps (M/H)				3.96	0.45				0.59		681.39	-0.73
Swamp	2.14	0.11	2.21	1.08				0.19		+3.35	454.47	0.74
Pindalup/Yarragil (L/M)	4.24	3.38	6.06					2.22		+9.14	1798.76	0.51
Murray (M/H)					1.01	0.51	0.73		0.02	-2.27	745.51	-0.30
	13.87	7.38	15.49	8.47	6.59	15.78	5.83	22.1	2.32	+5.09	11008.49	0.05
Approximate quantities of bauxite ore in excised areas (m tonnes)		-5		-<5	-5	-20	-20	+5	-20	-65		

Appendix 1 Table 3. Optimum representation of vegetation complexes in management priority areas for conservation within the study area

Vegetation Complex	Best Represented MPA	km^2	Second Best MPA	km^2	Third Best MPA	km^2	Main Potential Threat to Long term Survival+
Dwellingup (H)	Surface*	22.38*	Lennard	21.83	Plavins	11.30	Bauxite mining, dieback
Dwellingup (M/H)	Surface*	12.21	Cooke	17.09	Eagle Hill	11.33	Bauxite mining, dieback
Dwellingup & Yalanbee (L/M)	Trees*	27.75	Nalyerin*	39.12	Dale	21.47	Bauxite mining (LT), dieback
Dwellingup (L)	Duncan	23.09	Bennelaking	22.61	Russell	16.74	Bauxite mining (LT), dieback
Yalanbee (L)	Gunapin	24.29	Sullivan	16.55	Boyagarring	5.59	Bauxite mining (LT), dieback
Cooke	Duncan	26.45	Cooke	11.64	Windsor	12.13	Recreation, dieback, Dale
Goonaping	Sullivan	26.87	Surface*	23.78	Gunapin	15.42	Dieback
Wilga	Goonac	4.93	Noggerup	4.00	-		Agriculture, dieback
Yarragil (M/H) (Minimun Swamps)	Plavins	11.11	Samson*	10.32	Federal*	3.68	Dieback, dam construction
Yarragil (M/H) (Maximum Swamps)	Surface*	37.82	Dale	12.01	Trees*	9.04	Dieback, dam construction
Swamp	Gunapin	27.56	Surface*	17.24	Duncan	11.41	Dieback
Pindalup & Yarragil (L/M)	Trees*	19.93	Gunapin	45.01	Russell	28.56	Dieback, agriculture
Coolakin	Stene	13.53	Gyngoorda	9.20	Gunapin	3.78	Agriculture
Helena (M/H)	Lennard	30.71	Teesdale*	11.76	Gooralong	1.26	Agriculture, recreation
Helena (L/M)	Not represented within study area, but represented in Avon						Valley
Murray (M/H)	Eagle Hill	15.30	Karnet	12.73	Plavins	6.68	Dam constructio recreation
Murray (L/M)	Dale	18.52	Bell*	7.53			Agriculture, da construction
Williams River	Not represented within study area						Agriculture
Lowdon	Mullallup	9.93	Preston	9.20	Noggerup	8.50	Agriculture
Michibin	Boyagarring	5.38	Gyngoorda	3.86	Sullivan	1.99	Agriculture
Darling Scarp	Lennard	3.07	North Dandalup	0.28	Karnet	0.14	Agriculture, recreation
Forrestfield	Not represented within study area						Agriculture, urbanization
Collie	Westralia	5.52	-		-		Coal mining, dieback
Cardiff	Not represented within or outside study area						Coal mining, dieback
Muja	Westralia	4.47	-		-		Coal mining, dieback

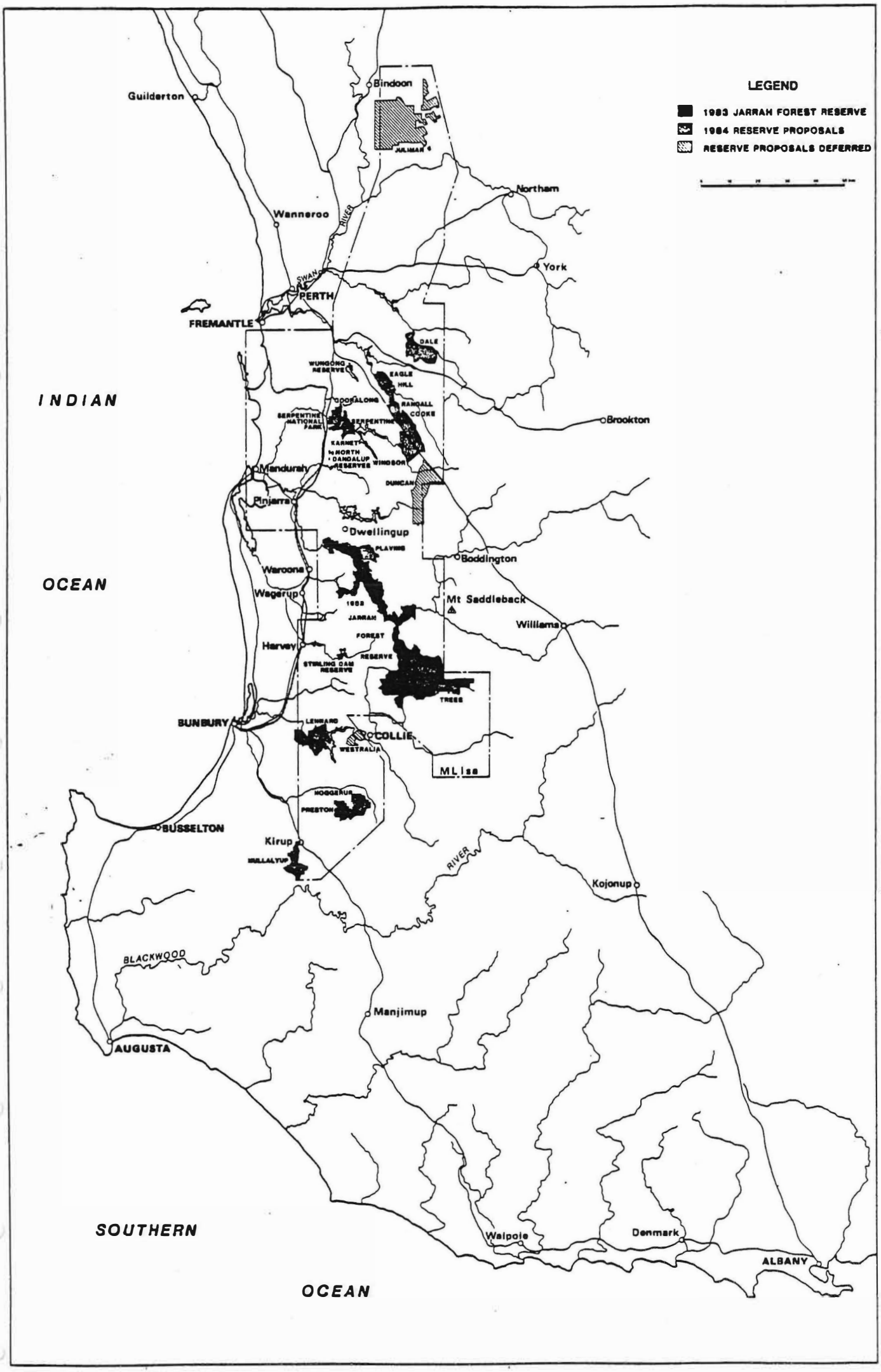
* Already incorporated in the Northern Jarrah Forest Reserve

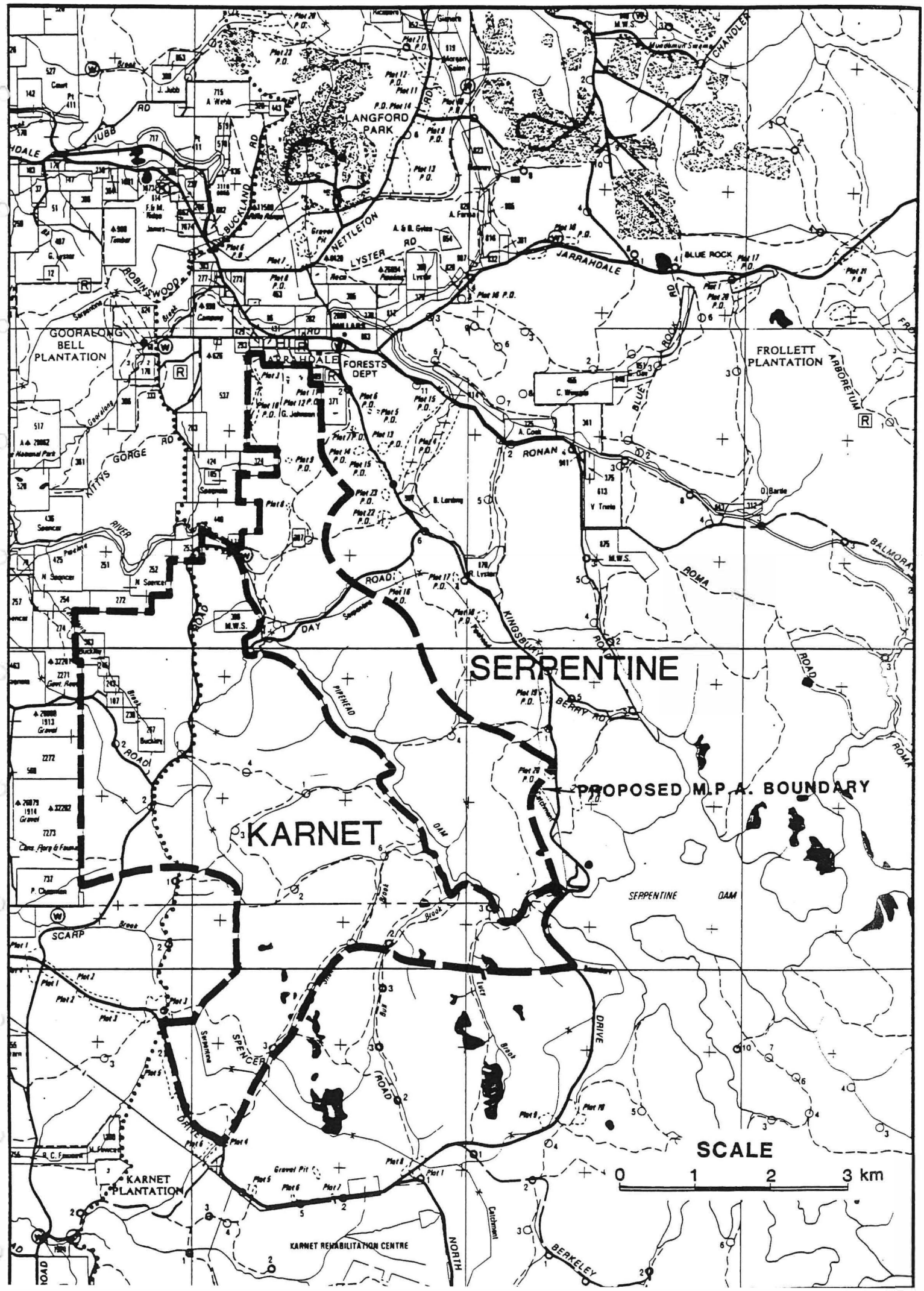
\+ Logging is assumed to have potential impact on most of the vegetation complexes, though less so on Cooke, Goonaping, Swamp, Helena, Williams River, Lowdon, Michibin and Forrestfield complexes.

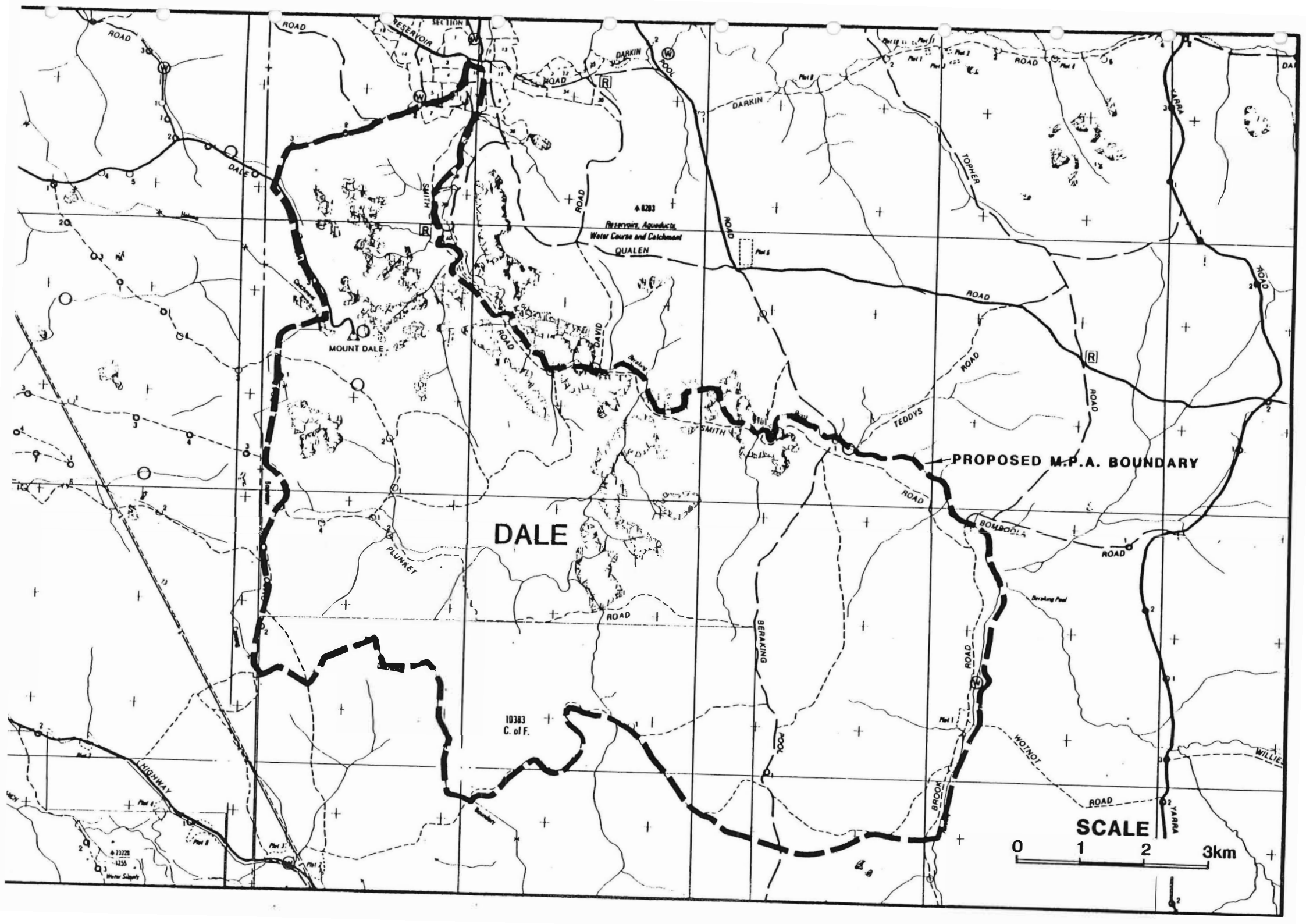
Appendix 1 Table 4. Impact of proposals on the timber industry. The accuracy of the figures is poor. Only approximate apportioning of larger totals has been undertaken.

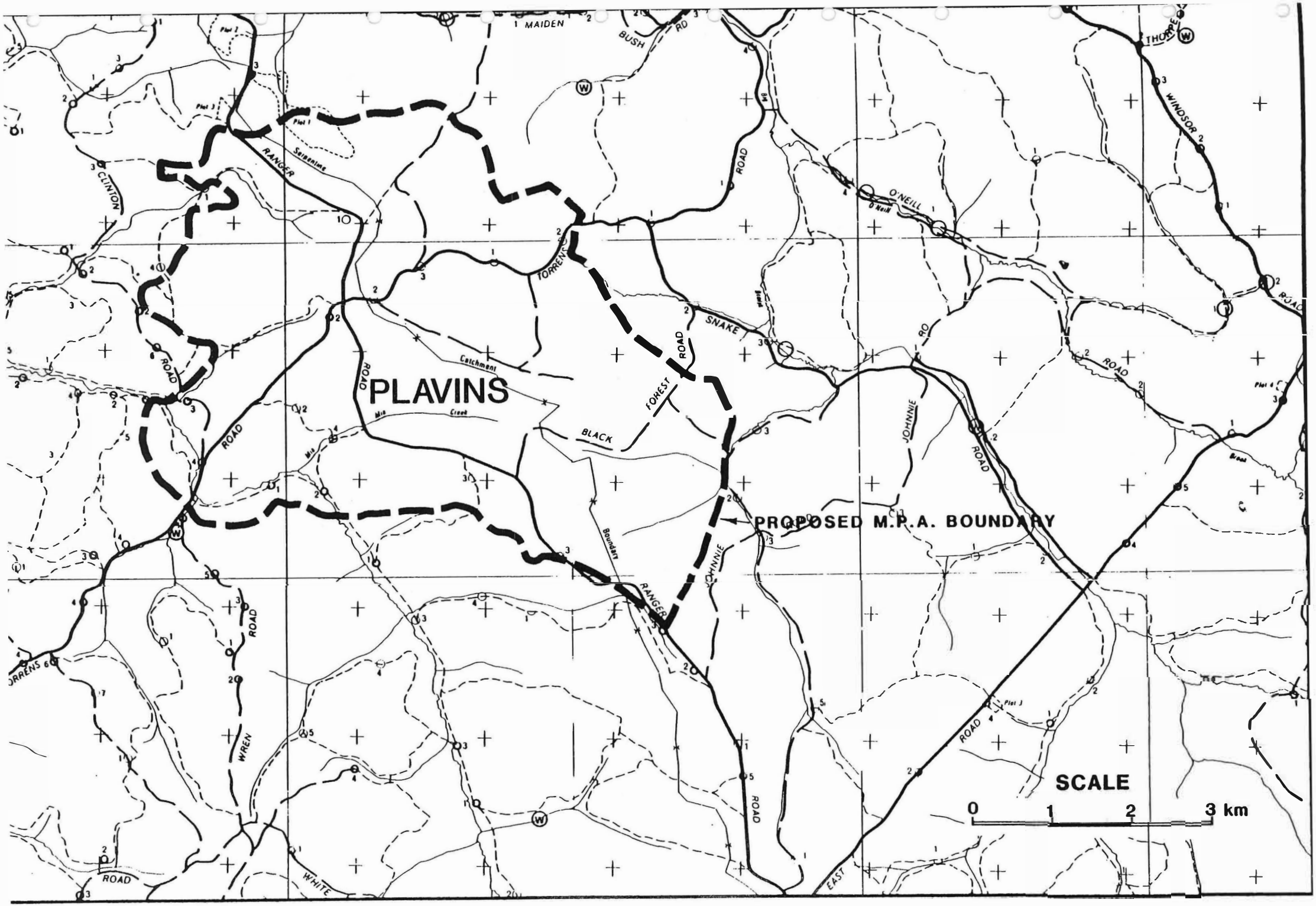
(M^3)

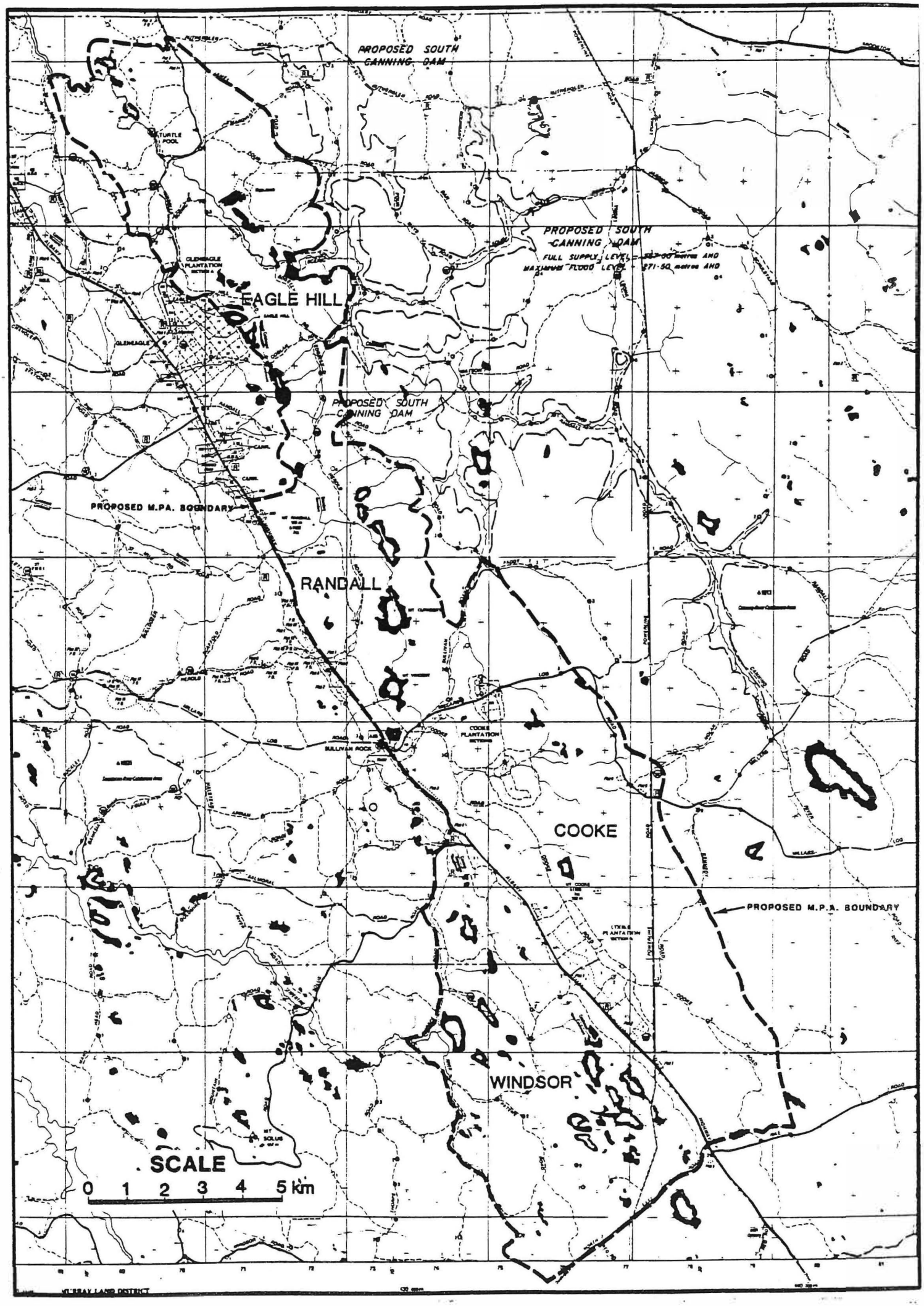
Management priority area	Volume of sawlogs in core and buffer	Volume foregone in 1982 GWP	Volume foregone in this proposal	Difference
Eagle Hill	35 800	24 050	26 383	
Cooke	43 600	29 700	23 955	
				- 17 783
Windsor	18 600	13 250	18 600	
Randall	-	-	15 845	
Serpentine	21 000	13 800	14 400	
Karnet	18 240	12 052	11 131	- 3 179
Cooralong	9 400	5 900	9 400	
Dale	19 600	14 100	22 623	- 8 523
Lennard	102 300	66 600	102 300	- 35 700
Mullalyup	51 100	39 400	51 100	- 11 700
Boggerup	54 900	48 100	54 900	
				- 24 650
Preston	46 800	28 950	46 800	
Plavins	51 200	41 700	43 040	- 1 340
Totals	472 540	337 602	440 477	- 102 875


LEGEND
1983 JARRAH FOREST RESERVE
1984 RESERVE PROPOSALS
RESERVE PROPOSALS DEFERRED
Guilderton
Bindoon
JULIMAR
Northam
Wanneroo
SWAN RIVER
York
PERTH
FREMANTLE
DALE
WUNGONG RESERVE
EAGLE HILL
KOOKALONG
RANDALL COOKE
SERPENTINE NATIONAL PARK
SERPENTINE
Brookton
KARNET & NORTH DANDALUP RESERVES
WINDSOR
Mandurah
DUNCAN
Pinjarra
Dwellingup
PLAVINS
Boddington
Waroona
Wagerup
Mt Saddleback
1983 JARRAH FOREST RESERVE
Williams
Harvey
STIRLING DAM RESERVE
TREES
BUNBURY
LENNARD
COLLIE
WESTRALIA
ML 1 s8
HOGGERUP
PRESTON
BUSSELTON
Kirup
WILLALYUP
RIVER
Kojonup
BLACKWOOD
Manjimup
AUGUSTA
Walpole
Denmark
ALBANY
INDIAN OCEAN
SOUTHERN OCEAN


SERPENTINE
KARNET
PROPOSED M.P.A. BOUNDARY
SCALE
0 1 2 3 km
LANGFORD PARK
GOORALONG BELL PLANTATION
FORESTS DEPT
FROLLETT PLANTATION
ARBORETUM
BLUE ROCK
JARRAHDALE
RONAN
KARNET PLANTATION
KARNET REHABILITATION CENTRE
SERPENTINE DAM
JUBB RD
BUCKLAND RD
NETTLETON RD
LYSTER RD
ROBINSWOOD
GORGE RD
KITTYS
RIVER
ROAD
DAY
PIPEHEAD
BERRY RD
KINGSBURY
ROMA
BALMORAL
SCARP
SPENCER
DRIVE
BERKELEY
CHANDLER
BLUE ROCK RD
Brook
Gravel Pit


DALE
PROPOSED M.P.A. BOUNDARY
MOUNT DALE
Reservoirs, Aqueducts, Water Course and Catchment
QUALEN
10383
C. of F.
SCALE
0 1 2 3km
ROAD
DARKIN
SMITH
DAVID
TOPHER
TEDDYS
BOMBOOLA
BERAKING
WOTNOT
PLUNKET
HIGHWAY
YARRA
WILLIE
BROOK
POOL


PLAVINS
PROPOSED M.P.A. BOUNDARY
SCALE
0 1 2 3 km
MAIDEN
BUSH RD
THORPE
WINDSOR
CLINTON
RANGER
ROAD
TORRENS
O'NEILL
SNAKE
FOREST
Catchment
BLACK
JOHNNIE
Boundary
WREN
WHITE
EAST


PROPOSED SOUTH CANNING DAM
PROPOSED SOUTH CANNING DAM
FULL SUPPLY LEVEL
MAXIMUM FLOOD LEVEL
EAGLE HILL
PROPOSED SOUTH CANNING DAM
PROPOSED M.P.A. BOUNDARY
RANDALL
COOKE
PROPOSED M.P.A. BOUNDARY
WINDSOR
SCALE
0 1 2 3 4 5 km