THE WEST AUSTRALIAN WOODCHIP INDUSTRY

WA CHIP & PULP CO PTY LTD

Report and Recommendations
of the
Environmental Protection Authority

Environmental Protection Authority
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i. SUMMARY AND RECOMMENDATIONS

WA Chip and Pulp Co (WACAP) proposes to produce 750,000 tonnes of woodchips per year for 15 years in the South West of the State from five sources according to the following schedule. The majority of the resource comes from State Forest managed by the Department of Conservation and Land Management.

PROPOSED RESOURCE DERIVATION (BY PERCENTAGE)

SOURCE OF WOODCHIPS	% 1991-1995	% 1996-2000	% 2001-2005
1. Low-grade logs from State Forest	66	54	45
2. Regrowth thinnings in State Forest	18	30	27
3. Saw mill residues	11	11	6
4. Plantations on private property	0	0	20
5. Native vegetation on private property.	4	4	0

An Environmental Review and Management Programme by WACAP was released for a 10 week public review from which the Environmental Protection Authority received 4,372 responses including 114 detailed written submissions. The Environmental Protection Authority also received additional information from WACAP, conservation groups and expert technical advice from the Department of Conservation and Land Management.

The Authority believes that the key issues in its assessment are associated with the impact on State Forest and on remnant vegetation on private land.

The assessment is based on the five proposed sources of woodchips which vary considerably in their impact.

ASSESSMENT OF ENVIRONMENTAL IMPACTS

1. LOW GRADE LOGS FROM STATE FOREST

(Note: Lowgrade logs here means those unsuitable for sawlogs which are harvested as part of silvicultural practises driven by sustainable harvest of sawlogs.)

The Environmental Protection Authority has concluded that the derivation of woodchips from low-grade logs from integrated operation in State Forest is environmentally acceptable as long as the conservation and amenity values of multiple use old growth forest in the Southern Forest Region and the salt sensitive areas of Jarrah-Marri forest in the Northern, Central and Southern Forest Regions, are maintained as outlined below.

MULTIPLE USE OLD GROWTH FOREST IN THE SOUTHERN FOREST REGION

The Environmental Protection Authority accepts that outside the reserve system conservation and amenity values in multiple use State Forest are maintained by:

. Road, River and Stream Zones;

. other unofficial reserves such as wetlands and granite outcrops where timber is not cut; and

. multiple use silviculture which maintains habitat for fauna by achieving mixed aged forest.

The Department of Conservation and Land Management has now released to the public its proposals for management of Road, River and Stream Zones. This proposal is intended to protect conservation and amenity values in Road, River and Stream Zones by a process of flexible management involving more ecologically-derived and amenity-based definition of zones and by less intrusive silviculture adjacent to these zones. The proposal would entail a redistribution (which the Authority accepts in broad principle) in terms of a reduction of Road Zones in favour of an increase in Stream Zones. It also would involve the application of flexible management practices which could result in an addition of timber resource. The Authority will review the details of how the proposal will be implemented. Until then, no cutting would occur in Road, River and Stream Zones.

This principle of flexible management, the Environmental Protection Authority believes, should not just be confined to Roads, Rivers and Streams but should become more prominent in the multiple use old growth forest areas. These areas were the focus of strong public support to help protect their special areas of high conservation values as well as their amenity for public use.

The Authority believes that by flexible management these conservation and amenity values can be protected in old growth forest without further reservation and within the constraints imposed by the Timber Production Strategy on the volume of sawmill timber.

The Authority proposes that the review of Road, River and Stream Zones be extended to include how flexible management could be applied in areas of high value, old growth forest. This would mean:

. The Department of Conservation and Land Management identifying and delineating on maps those special areas of high value, old growth forest, for example, parts of Jane block and Hawke block, as well as locations such as areas around picnic spots and look-out trees frequented by the public, at the same time as it is determining its preferred Road, River and Stream Zones. This process should involve public consultation.

. The Department of Conservation and Land Management proposing a flexible management regime for these special areas and Zones to protect their conservation and amenity values whilst providing for some harvesting and other productive uses. The Authority envisages that clearfelling would not occur in these special areas and Zones.

The whole proposal would be subject to environmental impact assessment by the Authority.

MANAGEMENT OF THE JARRAH-MARRI FOREST

Since the first environmental review of the woodchip industry in Western Australia in 1973 there has been a series of studies on the impacts of change in land use in Jarra-Marri forest areas. The main emphasis of these studies has been towards hydrological impacts; changes to water and salt as a consequence of changing land management. There have also been studies on the ecology of Jarrah-Marri forest, especially relating to forest disease, insect pests, and the ecological impacts of fire management.

Some aspects of the impacts of change in land use require further research, particularly among these are impacts on landscape amenity, flora and fauna habitat, conservation and long term productivity. The ecological effects of even short term surges of stream salinity and turbidity which may take place in sensitive areas have received insufficient attention.

There is an increasing demand for wood products from the Jarrah-Marri forest. The availability of knowledge gained from experience and information from research has enabled the Department of Conservation and Land Management to develop new systems for timber harvesting. These systems (Bradshaw 1986, 1987) contain elements of several classical systems of silviculture, including clear felling, group selection and uniform and grouped shelterwood. In the southern and western Jarrah and Marri forest any harvesting system which leads to complete overstorey removal is limited to gaps of 10 hectares. The silviculture systems are intended to enable intensified production to be maintained.

Western Australians have a high interest in the Jarrah-Marri forest, and it would be desirable if both the new research findings and the new silvicultural techniques were appropriately communicated to the general public. An expanded research programme is recommended to ensure that appropriate extra information is obtained to assist balanced management.

It is recommended that it is inappropriate to extend harvesting systems requiring complete overstorey removal into the salt-risk (less than 1100 mm rainfall) parts of the Northern and Central Jarrah-Marri forest prior to formal referral to the Environmental Protection Authority. It would appear that much of the hydrological information for such a review is available in scientific literature.

WACAP has proposed to extend access to Marri resource into the salt-risk zones of the Southern Forest Region, where it is claimed that specific research has shown that this is safe. The Environmental Protection Authority has examined this proposal, and recommended that it would be environmentally acceptable for such an expansion, subject to the preparation of an Environmental Management Programme (EMP) to the satisfaction of the Authority. The EMP would need to give prior details of salt-risk areas to be harvested, harvesting methods and safeguards to be applied, monitoring techniques which are proposed, and feed back mechanisms which would be used if salt impacts were found.

2. REGROWTH THINNINGS IN STATE FOREST

The Environmental Protection Authority has concluded that the derivation of woodchips from regrowth thinnings in State Forest is environmentally acceptable provided the Department of Conservation and Land Management's normal harvesting prescriptions are maintained.

Some environmental benefits from the facilitation of a less even-aged, more diverse forest would be achieved by the removal of some thinnings from regrowth forest.

3. SAWMILL RESIDUES

The Environmental Protection Authority has concluded that the derivation of woodchips from sawmill residues is environmentally acceptable.

The conversion of saw mill residues into woodchips is considered to be more beneficial than the burning of sawmill wastes.

4. PLANTATIONS ON PRIVATE PROPERTY

The Environmental Protection Authority has concluded that the derivation of woodchips from plantations on private property is environmentally acceptable.

Significant environmental benefits could be derived from plantations on cleared land, particularly if the plantations are established according to the Authority's recent publication "Environmental Guidance for Land Use and Development in Southern Western Australia."

Plantations can be seen as a way of easing resource pressures on native forest.

5. NATIVE VEGETATION ON PRIVATE PROPERTY

The Environmental Protection Authority has concluded that the clearing of remnant native vegetation from private property for the derivation of woodchips is environmentally unacceptable, except for isolated exceptions authorised by the Minister for Environment.

The rapid loss of native vegetation, particularly in the southern areas of the State, is of great concern. The Authority has summarized its reasons for protecting remnant native vegetation in the South West in its Assessment Report on the McLean Forest Project; it does not envisage that the WACAP proposal should be permitted to make the environmental impact that the McLean proposal was denied.

The clearing of remnant native vegetation to establish plantations on private land is also considered environmentally unacceptable.

There may be isolated exceptions where clearing remnant vegetation on private property for woodchips could be authorized by the Minister for Environment. A State Government policy should be developed aimed at the protection and management of remnant native vegetation on private land.

GENERAL MATTERS

As well as the five sources of woodchips the Authority has made conclusions on two general matters arising from the proposal.

1. TIMING OF RECOMMENDATIONS AND REVIEWS

The Environmental Protection Authority has concluded that its recommendations should be implemented immediately and that reviews and extensions of approvals for woodchipping should be linked directly to the 10 year review of the the Timber Production Strategy and Forest Region Management Plans. This means:

- WACAP's Forest Product Licence for woodchips should be reviewed February 1998; and

- WACAP and the Department of Conservation and Land Management should report to the Environmental Protection Authority briefly annually and comprehensively after 5 years on their research into impacts outlined in this report.

The Authority believes that although planning for timber resources requires a long time horizon there are significant uncertainties in environmental

impact which mean that the basis for decisions on the forest should be reviewed frequently. These uncertainties include global climate change, long term effects of forest management on nutrient cycling, water quality, plant diseases, pests and flora and fauna composition. Prudent management needs to consider these factors as well as commitments based on timber yields predicted late next century. This is particularly so as there is a real possibility of alternative resources available from, for example, private plantations, being preferred at that time. The Authority believes its conclusions and recommendations covering the next 10 years allow options to be kept open to allow for unpredictable circumstances in that period and over the next century.

The Authority believes that research on the uncertainties outlined above needs to be expanded and should be directed by the Steering Committee for Research on Land Use and Water Supply after wide consultation and with forest resource based industries participating or contributing to this research.

2. CONFLICT RESOLUTION

The Environmental Protection Authority concludes that continued use of wide consultative processes will further reduce conflict over forests issues.

Many issues were raised by the public reflecting conflict over forest use. Some conservationists differ with forest managers over their techniques of forest management. There are also conservationists who believe that forest should not be seen from a purely utilitarian view but that it has intrinsic value irrespective of any human needs. The Authority accepts that this philosophical difference underlies much of the conflict over forest issues.

Despite deep-seated differences there are also common objectives between conservationists and forest managers, eg:

. better utilization of the timber resource;

. production of value-added products, especially wood crafts;

. chipping of sawmill residues instead of burning them;

. establishment of plantations on cleared land; and

. production on a sustained yield basis.

Common pursuit of these objectives has the potential to minimise environmental impacts whilst allowing productive use of the forest. Widespread continuing consultation to allow such objectives to be reached would seem to the Authority to be essential rather than the alternative of an inquiry as pressed for in some submissions. The "Forests Accord" proposal from the Commonwealth also presupposes such ongoing consultation.

CONCLUSIONS

The Environmental Protection Authority has therefore concluded that the State could supply resource to WACAP within levels specified in the Timber Production Strategy in accordance with the Authority's Recommendations in this Report and details in the ERMP and supplementary information.

Specifically the Authority concludes that there is scope for WACAP to produce up to 750,000 tonnes of woodchips from resources in South-Western Australia. The limits to producing woodchips from old-growth forest outlined in the Timber Production Strategy are:

1980 - 1990, 583,000 cubic metres
1991 - 1995, 553,000 cubic metres
1996 - 1998, 442,000 cubic metres

The shortfall between woodchips derived from old growth forest and from the quantity sought by WACAP would be made good from thinnings from regrowth forest, or eucalyptus plantations on private properties.

The Authority further considers that, subject to the above, the conversion of timber resource into woodchips and their transportation and export are environmentally acceptable.

The Authority's recommendations are:

RESOURCE FROM INTEGRATED HARVESTING OPERATIONS

RECOMMENDATION 1

The Environmental Protection Authority considers that there is no rational justification for confining the taking of wood chip resource to the existing Woodchip Licence Area. The recommendations in this Report should therefore be taken to refer to all of the Northern, Central and Southern Forest Regions.

RECOMMENDATION 2

The Environmental Protection Authority notes the volume of woodchip production from old growth forest described in the Timber Production Strategy. The Authority recommends that this be strictly observed.

RECOMMENDATION 3

The Environmental Protection Authority accepts in principle the proposal by the Department of Conservation and Land Management to introduce flexible management to Road, River and Stream Zones. The Authority accepts that these zones should be redistributed and managed to protect the values for which they are intended. ie in Road Zones these will include, principally, the protection of visual amenities and the provision of faunal refuges, and in Stream Zones, protection against silt and salt impacts and also the provision of faunal refuges.

The Authority recommends that the Department of Conservation and Land Management consult with the public to develop a detailed proposal for Road, River and Stream Zones to be submitted to the Environmental Protection Authority for environmental impact assessment. No cutting of Road, River and Stream Zones should occur in the interim.

RECOMMENDATION 4

The Environmental Protection Authority recommends that the Department of Conservation and Land Management, as part of the review and referral to the

Authority of Road, River and Stream Zones, be required to identify within old growth State Forest:

- additional areas of high value old growth forest meriting special treatment in the sense that they should be managed and harvested flexibly rather than be subject to broad-scale clearfelling; and

- areas which should be excluded from harvesting to protect their exceptional scenic, faunal, and other amenity values.

A scheme of management for these special areas should be proposed.

RECOMMENDATION 5

The Environmental Protection Authority notes the evolution of more intensive systems of harvesting in the Jarrah-Marri Forest. The Environmental Protection Authority recommends that there should only be continued selection cut harvesting from the salt-risk zones of the Central and Northern Jarrah-Marri forests. Any proposal to harvest this area more intensively should be referred to the Authority.

The proposal to supply WACAP with Marri resource in the salt-risk zones of the Southern Forest Region should be preceded by preparation of an Environmental Management Programme (EMP) to the satisfaction of the Authority. The EMP would need to give prior details of salt-risk areas to be harvested, harvesting methods and safeguards to be applied, monitoring techniques which are proposed, and feed-back mechanisms which would be used if salt impact were found.

RECOMMENDATION 6

The Environmental Protection Authority concludes that the production of woodchips using thinnings from multiple-use State Forest is environmentally acceptable and recommends that it could continue.

RESOURCE FROM SAWMILL RESIDUES

RECOMMENDATION 7

The Environmental Protection Authority concludes that the chipping of residues from sawlogs is environmentally acceptable and recommends that it could continue.

RESOURCE FROM PLANTATIONS

RECOMMENDATION 8

The Environmental Protection Authority concludes that chipping of resource derived from plantations established on cleared private property is environmentally acceptable, although plantation establishment would still require appropriate management to maintain water quality and quantity and other environmental objectives, and recommends that the State continues to encourage plantation establishment.

RECOMMENDATION 9

The Environmental Protection Authority recommends that the State develop a way by which proposed Eucalyptus plantations be located to optimise environmental benefits.

RESOURCE FROM NATIVE VEGETATION ON PRIVATE PROPERTY

RECOMMENDATION 10

The Environmental Protection Authority concludes that clearing of remnant native vegetation on private property for the purpose of producing woodchips is, in general, environmentally unacceptable. The Environmental Protection Authority recommends that this not be permitted except for individual exceptions authorised by the Minister for Environment.

RECOMMENDATION 11

The Environmental Protection Authority concludes that the clearing of remnant native vegetation on private property to establish plantations is, in general, environmentally unacceptable and recommends that it not be permitted except in individual cases authorized by the Minister for Environment.

RECOMMENDATION 12

The Environmental Protection Authority recommends that the State Government develop a policy for the protection and management of remnant native vegetation on private property. This policy should include recognition of the landscape, water quality and quantity, soil protection and conservation values of remnant native vegetation, as well as their potential for management as a productive resource.

TIMING OF FUTURE REVIEWS

RECOMMENDATION 13

The Environmental Protection Authority concludes that State Government approvals, including the Forest Produce Licence, for WACAP's woodchip operations based on State Forest resource should be linked specifically to the duration of the Timber Production Strategy and Forest Region Management Plans and recommends that State approvals be reviewed at the expiry of the present Management Plans, which is currently planned for February 1998.

FURTHER RESEARCH

RECOMMENDATION 14

The Environmental Protection Authority recommends that research on the effects of intensive extraction of wood products in both the Jarrah-Marri and the Karri forest be expanded to give greater priority to the impacts on ecological (conservation) and recreational values.

The Environmental Protection Authority further recommends that the detailed objectives and priorities for research into the environmental impacts of the proposal be determined by the Steering Committee for Research on Land Use and Water Supply after wide consultation. This Committee should have amended terms of reference and composition accordingly.

The Authority considers that it would be appropriate for forest resource based industries to participate in, or contribute to, this research.

IMPLEMENTATION AND AUDIT OF EPA RECOMMENDATIONS

RECOMMENDATION 15

The Environmental Protection Authority, being of the view that implementation of this report would make it possible to improve environmental protection of the South-Western Forests without adverse impacts on timber resources, recommends that its recommendations be implemented immediately rather than at the expiration of the current export licence.

RECOMMENDATION 16

The Environmental Protection Authority recommends that the WA Chip and Pulp Co Pty Ltd and the Department of Conservation and Land Management report to the Environment Protection Authority briefly annually and comprehensively after five years on the monitoring and management of the environmental impacts of the proposal.

RECOMMENDATION 17

The Environmental Protection Authority, being of the view that the use of continuing consultative processes by all sections of the community is the most beneficial way to reduce conflict over forest issues recommends that all concerned should explore ways of ensuring regular consultation in relation to the matters dealt with in this report.

1. INTRODUCTION

The statutory approvals and Agreement within which the existing Western Australian woodchip export industry operates expire on 10 May 1991. The WA Chip & Pulp Co Pty Ltd (WACAP), which has a woodchip export licence, has made application to the Commonwealth Minister for Primary Industries and Energy for the renewal of this licence for a further 15 years beyond that date.

WACAP's operations within Western Australia are also subject to the Wood Chipping Industry Agreement Act 1969-73 and a Forest Produce Licence. The Company is seeking a similar extension of both of these.

As State and Commonwealth approvals are required, an Environmental Review and Management Programme/Draft Environmental Impact Statement (ERMP) was prepared in accordance with the requirements of the Western Australian Environmental Protection Act 1986 and the Commonwealth Environment Protection (Impact of Proposals) Act 1974-86. The ERMP was released for public review for ten weeks, ending on 6 July 1987.

A Supplement to the ERMP, which provided formal response by the Company to issues raised in the submissions and additional information relevant to the assessment, was submitted to the Commonwealth Department of the Arts, Sports, the Environment, Tourism and Territories on 22 February 1988. This document, combined with the ERMP, comprises the Final EIS required under the Commonwealth Act.

Four thousand three hundred and seventy two separate submissions were received by the Authority on the ERMP and approximately 5130 submissions were received by the Commonwealth. Almost all of these were in the form of printed postcards or newspaper cutouts which either supported or opposed the proposal. Detailed comments on the proposal were provided in 114 written submissions.

In evaluating the environmental implications of the proposal, the Authority has considered the information provided by the proponent in the ERMP and Supplement as well as points made in submissions. The Authority has also obtained information on a number of issues related to this proposal. Representations from WACAP and conservation groups have addressed the Authority on specific issues. In addition expert technical advice has been received from the Department of Conservation and Land Management and others.

2. BACKGROUND

The assessment of this proposal is unusual in that it is the second review by the Authority of WACAP's woodchip export industry. It relates to the continued operation of an existing industry rather than its establishment.

The Western Australian woodchip industry was the subject of review by the Authority during the period 1973-1975. In addition, the Authority has had a continuing involvement in research carried out within the Woodchip Licence Area.

In 1973, following amendment to the Wood Chipping Industry Agreement Act 1969 the Authority conducted preliminary assessment of the proposal to establish a woodchip industry based on State Forest resource near Manjimup.

The then Forests Department prepared an Environmental Impact Statement (EIS) on the Marri Wood Chip Project (Forests Department, 1973). This document was made available to the public and reviewed by the Authority.

Two reports on the project were provided by the Authority. The First Interim Report (EPA, 1973) contained the following comments:

(i) the Authority noted that it was being asked to advise on environmental aspects of a project that had already been approved by an Agreement Act of State Parliament and that this Agreement had been signed by the State Government,

(ii) the Authority accepted the advice of the Forests Department that the proposal would assist in silvicultural management of the State Forest,

(iii) potential problems relating to protection of water quality of the groundwater and surface waters in the region were well recognised and would be investigated by two major study groups,

(iv) proposals of the Forests Department in relation to other environmental issues such as fauna conservation, dieback control and tourist recreation facilities would appear to be acceptable, and

(v) the Authority remained unconvinced that sufficient is known about environmental implications of the woodchip proposal for it to be completely endorsed at that point in time.

The Authority's reservations about the project at the time (1973) were summarised as follows:

> "on the one hand the State has the obligation to provide 670,000 tons of green weight timber per annum for fifteen years.
>
> on the other hand guided by research findings, the Conservator can excise areas for various environmental reasons.
>
> In simple terms, as research results become available, these two actions may prove to be mutually irreconcilable." (EPA, 1973)

A programme of research to address the key concerns was commenced. Initial findings of these investigations, information received from other sources, and further discussions with the Forests Department permitted the Authority to present its Second Interim Report (EPA, 1975).

In that report, the Authority advised that it

> " ....is now satisfied that:
>
> (a) salinity problems associated with the Manjimup woodchip project will be minimal, provided that the logging areas are suitably selected,
>
> (b) the forest management techniques to be employed are the best for the assured regeneration of prime forest,...." (EPA, p 8)

Further research has been undertaken in the interim period and is reported in Section 5.

Export of woodchips from Western Australia commenced in May 1976. During the following 12 years, the experience gained and research undertaken into the woodchip industry has been used to modify activity in the forest. The ERMP points out the following changes that have occurred as a consequence of research and harvesting trials (WACAP, p 71):

. harvesting plans are issued with a constraint that summer stockpiling of up to 25% of the permissible intake would be required to operate within the plan;

. location of log landings and snig tracks are planned in advance for each faller's block;

. new harvesting equipment has been purchased by industry;

. log landings and snig tracks are rehabilitated by specially equipped bulldozers, and

. coupes are closed for the winter if soil moisture limits are exceeded.

At present the WA Chip and Pulp Co Pty Ltd is the only woodchip export operator in Western Australia. The Company produces woodchips at its mill near Manjimup and exports through the Port of Bunbury.

The Western Australian woodchip export industry is presently subject to three statutory controls. WACAP's operations within the State are subject to the Wood Chipping Industry Agreement Act 1969-1973 and its related Forest Produce (Chipwood) Licence No 1588. Commonwealth control is exercised by the Minister for Primary Industries and Energy through the provisions of the Commonwealth Export Control (Unprocessed Wood) Regulations made under the Export Control Act 1982.

Each of these approvals is due to expire in May 1991. For WACAP to continue to operate beyond that date, further approvals will be required.

3. DESCRIPTION OF PROPOSAL

The proposal by WACAP as described in the ERMP is for the Company to obtain state approvals to export a maximum of 750 000 green tonnes per year of Marri, Karri and Jarrah woodchips produced from timber not suitable for sawmilling or other special purposes. In addition, the renewal of Commonwealth approvals for the export of this 750 000 green tonnes as well as an additional maximum of 150 000 green tonnes per year of Jarrah woodchips produced solely from sawmill residues obtained in Western Australia is sought. Each approval would be for 15 years from May 1991.

In essence, the WACAP proposal involves the following:

(a) approval by the State Government, through renewal of the Wood Chipping Agreement Act and Forest Produce Licence, for an assured supply of wood from State Forest within the Woodchip Licence Area;

(b) an increase in the areas of State Forest outside the Woodchip Licence Area, from which woodchips could be taken via integrated harvesting operations. Integrated harvesting involves the harvesting of a range of log products, such as chiplogs, sawlogs, poles and firewood, in a concurrent or closely linked operation;

(c) the intensification of harvesting operations in the Low Rainfall or Salt-Risk Zone of the Woodchip Licence Area;

(d) the conversion of plantation-derived wood into chips;

(e) continued supply of sawmill residues, either in the form of woodchips or waste material which can be chipped, and

(f) continued access to wood resulting from the clearing of native vegetation on private property.

The existing Forest Produce (Chipwood) Licence (1973) states that:

> "....the Company [WACAP] is hereby licensed for a period commencing on the day of 19 and expiring fifteen (15) years after the date of the first export of wood chips under or for the purposes of the said Agreement to fell cut and remove during the currency hereof a quantity of MARRI KARRI JARRAH or other species of timber not suitable for saw-milling or other special purposes as defined by the Conservator of Forests measured in the round sufficient to produce six hundred and seventy thousand (670,000) tons green weight of chips per annum on and from the area delineated on the plan in the Schedule hereto..... ".

This area, known as the Woodchip Licence Area, is shown in Figure 1.

Table 1 provides details of chiplogs and woodchips supplied to WACAP over the past 12 years.

Table 1. Previous Sources and Volumes of Chiplogs and Woodchips Supplied to WACAP (cubic metres).

	STATE FOREST		PRIVATE PROPERTY	SAWMILL RESIDUES
	old growth forest	re-growth forest	old growth forest	
	(chiplogs)		(chiplogs)	(woodchips)
1975/76	98 370	--	--	--
1976/77	337 021	--	--	29 463
1977/78	434 377	--	--	73 568
1978/79	454 096	--	15 241	94 452
1979/80	558 117	4 174	53 197	113 165
1980/81	495 716	19 359	58 983	154 313
1981/82	345 803	23 404	16 116	61 363
1982/83	385 278	26 839	21 835	63 771
1983/84	417 760	27 254	57 598	71 957
1984/85	472 441	24 439	91 702	72 668
1985/86	482 962	31 473	64 914	90 936
1986/87	496 440	56 253	99 923	72 515

(Source: Forests Department/CALM Annual Reports)

The commitment by the State to provide WACAP with chiplogs from State Forest has been incorporated in the Timber Production in Western Australia strategy (CALM, 1978a). The volume projections given in this Timber Production Strategy comprise Karri and Marri chiplogs from harvesting operations mainly in the Southern Forest Region but also include chiplogs from the southern part of the Central Forest Region, which is not within the Woodchip Licence Area. These projections have been incorporated in Figure 2. No separate data are presented in the Timber Production

Strategy to distinguish the volume of chiplogs taken from each of these regions. However, Table 19 of the ERMP provides an indication of the resource from outside the Licence Area that is potentially available.

Chiplogs from State Forest are proposed to continue to be derived from mature Karri/Marri and Jarrah/Marri forest inside and outside the Woodchip Licence Area and from regrowth Karri thinnings. However, at this time only Karri and Marri woodchips have an export market.

WACAP proposes in the ERMP that there be no change to the boundary of the Woodchip Licence Area as defined in Forest Produce Licence No. 1588, nor any changes to the licence volumes, rail transport or port operations. The ERMP indicates that WACAP's resource will continue to be derived from State Forest within and outside the Woodchip Licence Area, from private property and from sawmills, although the proportions are expected to change over the next 18 years. These changes are summarised in Table 2 and Figures 3 & 4.

Table 2. Projected Sources and Volumes of Chiplogs and Woodchips available to WACAP 1987-2005 (cubic metres per annum).

	STATE FOREST		PRIVATE PROPERTY		Sawmill Residues
	old growth forest	re-growth forest	old growth forest	re-growth & plantation	
	(chiplogs)		(chiplogs)		(woodchips)
1987-1990	583 000	90 000	57 000	6 000	79 000
1991-1995	553 000	90 000	25 000	8 000	73 000
1996-2000	442 000	170 000	25 000	50 000	71 000
2001-2005	452 000	190 000	--	180 000	51 000

(Sources: CALM - Table 16, 1987a and WACAP-ERMP and Supplement)

Supply of chiplogs from State Forest is undertaken by the Department of Conservation & Land Management under the provisions of the Conservation and Land Management Act 1984. Harvesting and forest regeneration operations within the Woodchip Licence Area are conducted in accordance with CALM's 'Southern Forest Region Industry Control Specifications' and 'Southern Forest Operations Manual'. For harvesting operations in State Forest outside of the Woodchip Licence Area, control is through CALM's 'Code of Hardwood Logging Practice'.

Within State Forest, the following changes to existing harvesting and environmental management practices are proposed in the ERMP (WACAP, 1987):

- modification of the distribution of the present Road, River and Stream Zone system to recognise the conservation value of mature forest widely dispersed within young regenerating forest, especially with respect to fauna that use tree hollows, the habitat diversity and species richness of stream areas, and the viability and effectiveness of relatively narrow corridors, especially when located low in the landscape;

- an increased role for stream buffers although the need for permanent buffers might be reduced by the development of 'phased' operations in the Low Rainfall Zone. Phased operations would involve harvesting buffer zones several years out of phase with adjacent slopes and uplands;

- lifting the 1973 embargo on combined sawlog and chiplog harvesting operations in the Low Rainfall Zone, subject to appropriate buffer retention;

- the development of a practical method of assessment of groundwater depth and soil salinity in the groundwater discharge zone in the Low and Intermediate Rainfall Zones. This would enable buffer zone demarcation and phased harvesting to be better tuned to specific localities. This may be achieved by drilling and sampling, by refinement of site-vegetation types to serve as predictors, or by geophysical techniques;

- reduce road reserves to the minimum acceptable width, consistent with maintenance of visual amenity;

- use of the area equivalent to that excised from the Road Reserves to provide buffers on first, second and third order streams;

- explore the practicability, structure and frequency of fauna movement corridors across geographical saddles to link stream headwaters. These corridors may need only consist of habitat trees and so could be thinned for sawlogs;

- remove the original (1973) EIS constraint of 20 percent of each forest block reserved so that blocks that do not need 20 percent can be reduced and those that need more can be increased, with the total buffer areas being maintained at an average of 20 per cent of the forest block area;

- selective thinning of [Road, River and Stream] reserves, consistent with their protection role;

- CALM will negotiate with the principle harvesting contractor to assume responsibility for all harvesting operations on State forest, and

- CALM has called for expression of interest to establish a sawmill adjacent to the WACAP chipmill, for logs considered to have sawmill portions.

In addition to resource from State Forest, WACAP obtains chiplogs and woodchips from other sources, including private property and also sawmills. The quantities involved over the past 12 years are listed in Table 1.

Private property operations by WACAP are subject to controls imposed under the provisions of the Country Areas Water Supply Act 1947-78 and the Soil and Land Conservation Act 1945-82. In relation to the former, clearing controls apply within specific catchments, namely the Kent, Warren, Collie, Denmark and Helena, while the latter Act provides a requirement to give notification of intent to clear any area in excess of one hectare.

The ERMP indicates that WACAP's area of operation is generally within 180 km of the woodchip mill site, although resource can be economically obtained from distances of up to 300 km if back-loading of trucks can apply. In addition to removing chiplogs, WACAP also has several schemes which provide for the establishment of plantations on private property as a long term resource.

An important component of WACAP's private property operations are activities on its own freehold land. These include logging of old growth forest and the establishment of eucalypt plantations. These plantations would supply an

increasing and significant portion of WACAP's woodchip resource during the period of the proposed licence.

4. PUBLIC REVIEW

The ERMP was released for public review for a period of 10 weeks, closing on 6 July 1987. As the document was prepared for both State and Commonwealth requirements, submissions were received by the Authority and the then Department of Arts, Heritage and Environment. All submissions were made available to the other agency as well as the proponent, in accordance with Commonwealth requirements.

A total of 4372 submissions were received by the Authority, including 4258 proforma letters and 114 individual submissions, the latter including 8 from State and Local Government agencies and 106 from members of the public and private organisations. More than 5130 submissions were received by the Commonwealth.

The numbers of submissions received and the scope of concerns raised are summarised in Appendix 1 to this Report. As with EPA's own conclusions, submissions related more to management of the State forest and derivation of woodchip resource than to the conversion of chiplogs into woodchips and their export. In particular, the major issues raised were:

- the need to retain the conservation values of high value, old growth forest not included in the Reserve system;
- the increased intensity of harvesting in the Jarrah-Marri forest with potential salinity and other impacts; and
- the loss of remnant native vegetation on private land.

The EPA has endeavoured to respond to all environmental issues raised in submissions in this Report either explicitly, or implicitly by recommending mechanisms whereby they can be addressed in detail.

5. REVIEW OF RESEARCH ON WOODCHIP OPERATIONS

5.1 EARLIER PREDICTIONS OF IMPACTS

The WACAP project was subject to environmental assessment by the EPA in 1973-75. An Environmental Impact Statement was prepared by the then Forests Department and was made available to the public. Two assessment reports were prepared by the EPA. The recommendations in these reports were outlined in Section 2 of this report.

A number of predictions of environmental impacts that could arise as a consequence of the woodchip project were presented in the 1973 EIS. Some of these have been the subject of research over the past fourteen years. During this period, some changes to forest management practices have been made. A summary of this information is presented below.

The Forests Department made the following environmental impact predictions in the 1973 EIS:

(a) Commercial forest

- expanded bush operations will increase the risk of spread of dieback in the Jarrah-Marri forest despite strict observance of forest hygiene;

- the almost total defoliation resulting from clearfelling may cause the leaf miner population to drop dramatically; and

- more smoke will be injected into the atmosphere from slash burns.

(b) Stream flow

- the effect of clearfelling on regional precipitation is generally accepted to be insignificant;

- interception of precipitation by vegetation will initially decline, followed by progressive increase to previous levels within 10 years of the slash burn;

- clearfelling can be expected to increase runoff by 30-50 per cent immediately and to reduce to normal over 5-6 years;

- increased soil erosion will be a distinct possibility, especially that resulting from winter logging, from log roads, and from regeneration and slash burns;

- increased sedimentation and turbidity could occur if logging leads to erosion;

- the use of herbicides may affect water quality;

- Karri and Karri-Marri areas are for the time being classified as safe with regard to salinity; and

- partial removal of vegetation by selection cutting in the north-east sector of the licence area must result in at least a temporary increase in groundwater and movement of salt concentrations into drainage lines.

(c) Flora

- tree speciation in the forest will not suffer; in fact, it will be possible to manipulate the percentage composition towards the most desirable timber species;

- the scrub and herb species are unlikely to suffer, either through logging operations or burns; and

- the vegetation will undergo natural successional changes normally associated with fire.

(d) Fauna

- some small mammals such as rodents and marsupial mice, some of the birds of the undergrowth and reptiles and amphibia, which survive the felling operation may disappear after the slash burn;

- cut-over burnt areas are quickly recolonised by fauna;

- some species of animals, such as the Numbat and Woylie, would not survive the logging operations;

- there will be an increase in introduced animals, such as rabbits, fox, cat and the mouse; and

- there will be a short term loss of honey and pollen production;

- those species which frequent the canopy and those that need holes in trees for breeding purposes will remain severely reduced in numbers; and

- species that favour dense undergrowth and regrowth stands will increase in numbers.

(e) Amenity

- until regrowth crops become well established (4-8 years) the amenity value of clear fallen or selectively cut areas will be nil;

- if not taken into account, the tourist and recreational values for the region could fall sharply and cause hardship as well as adverse criticism; and

- burning operations, coupled with the concepts of 'clear felling' and to a lesser extent 'just cutting forests', poses the greatest adverse environmental impact resultant from the project.

In recognition of these potential impacts, a range of commitments were made to reduce them. They were contained within the 1973 EIS, the Wood Chipping Industry Agreement Act and Forest Produce (Chipwood) Licence, and included:

(a) Commitment of resource

- preventing the chipping of wood suitable for sawmilling or other special purposes;

- restricting the gross operating area to that defined by the Woodchip Licence Area;

- restricting the operation time to 15 years, combined with area limitations, wood type acceptability and set gross tonnages, provides for a resource surplus available in the forest for alternative uses and the opportunity to cease or restrict exports after 15 years and increase the local processing component if required; and

- the setting of royalty rates and export price rates to ensure the resource is justly valued.

(b) Operational control

- ensuring road safety on highways and control of trafficable haulage routes in the forest;

- improving efficiency of cutting to minimise waste and damage to remaining forest;

- maintaining control of the location and extent of cutting areas and coupes;

- State Government control of the location and extent of the chipping site, railway use and port and storage facilities; and

- control of the regeneration of the public wood resource by the Forests Department.

(c) Environmental protection

. compliance with environmental protection requirements made by the State or State agency or local authority;

. water catchment pollution is protected under Country Areas Water Supply Act;

. protection from stream sedimentation and obstruction is provided by allowances for uncut stream verges, felling near and into streams, and roads;

. minimise stream salinity increases through provisions to restrict cutting in sensitive areas;

. minimisation of concerns about smoke pollution and noise from the chipping site by the specification of a suitable location for the chip mill;

. wildlife protection by provision for stream and road verges and corridors, restricted coupe size and maximum dispersion, and refuge areas;

. fauna populations within the licence area have been investigated and a continuous monitoring system has already been established;

. improved bushfire protection;

. effective control of dieback infection; and

. representation of the State and National interest in that the State Cabinet must approve the Agreement and the Commonwealth Government only can grant the required export licence.

5.2 SUMMARY OF RESEARCH

Some of the more important research undertaken since the woodchip industry commenced operations and which has influenced details may be obtained from the references and list of publications in Appendix 2. Some of these areas of research include:

(a) Research into the effects of logging on stream-flow and water quality and groundwater movement. (WAWA and CALM).

(b) Research on soil compaction and soil movements in coupes. (CALM and CSIRO).

(c) Research on effects of logging practices on vertebrate communities, in particular, birds. (CALM).

(d) Research into nutrient cycling (CSIRO) in forest understorey plants and litter.

(e) Research on the distribution of vertebrate fauna and flora in the Southern Forests. (CALM).

Most of this research is continuing.

5.3 REVIEW OF INVESTIGATIONS

The operations of the woodchip industry and related research have led to a large amount of information becoming available by which the predicted impacts could be measured. The Authority has reviewed this information on impacts identified in the 1973 EIS to assist it in determining what have been the environmental implications of the woodchip industry during the 12 years of its operations.

In 1973 and 1975, the Authority pointed to the need to undertake research into environmental impacts related to clearfelling within the Woodchip Licence Area. The State Government implemented a research programme to consider and address these concerns.

The EPA was able to provide its 1975 advice to Government because the Steering Committee on Research into the Effects of the Woodchip Industry on Water Resources in South Western Australia had undertaken preliminary research during the previous two years, and detailed discussions on the nature of the proposal and commitments had been conducted with the then Conservator of Forests.

Of prime concern to the Authority in 1973 was the potential impact of the proposal on water quality in the Woodchip Licence Area. The Steering Committee established four projects to investigate these impacts. These projects were:

- Project 1 - identification of areas vulnerable to salinity increases.
- Project 2 - monitoring of surface and underground water changes in "paired catchments".
- Project 3 - monitoring of major catchments of rivers draining the Woodchip Licence Area for changes in water quality.
- Project 4 - monitoring of underground and surface water using selected operational coupes as experimental catchments.

Reports on this research on water quality within the Woodchip Licence Area have been published in 1978, 1980 and 1987 (DCE, 1978, 1980; Steering Committee for Research on Land Use and Water Supply, 1987). This research has reached the following general conclusions:

- In the High and Intermediate Rainfall Zones, logging operations have caused small and temporary increases in stream salinity and/or sediment concentration in many local streams but this presents no significant threat to regional water resources.
- Further refinement of logging practice is possible to moderate local transient effects on stream salinity and sediment concentration.
- With appropriate management, there is no significant stream salinity risk from heavy selection cutting in the low rainfall north-east sector of the Woodchip Licence Area.

These impacts are considered minor from the regional water resource perspective. However, the 1987 Steering Committee Report also indicates local impacts on ground water levels, stream salinity, and stream turbidity, even if temporary may be significant. Local water supplies, and the ecology of lower slopes wetlands and stream are likely to be affected. Such local

effects are most significant in the intermediate rainfall zone (900-1100 mm average annual rainfall). The Report makes recommendations for refinement of management operations throughout the project area to take account of its findings.

CALM has initiated research into the flora and fauna of the forests within the Woodchip Licence Area. The list of references in the Southern Forest Region Management Plan provides details of some of this research. In addition, the ERMP lists the current research programme of CALM, and this includes investigations into aspects of fauna use and flora distribution in the Southern Forest Region (WACAP, p 249). A list of research on aspects of the Karri and Jarrah forests of Western Australia has been prepared for the Authority and is presented in Appendix 2.

In the Karri forest, there has been substantial research undertaken by the Forests Department and CALM. While this has included investigations into aspects of the ecological impacts of clearfelling, the predominant research effort has related to silvicultural practices. More recently, ecological research has become more prominent.

While acknowledging that further research is needed, the Authority believes that it is in a position to report at this time and points to new directions for future research in Section 7 of this Report.

6. ASSESSMENT OF ENVIRONMENTAL IMPACTS

6.1 INTRODUCTION

It is obvious from the discussion in the ERMP that the assessment of the WACAP proposal is not just a review of the chipping of wood. Rather, the review also includes the harvesting of timber from which chiplogs are derived as, within State Forest, CALM conducts chiplog supply as part of its integrated harvesting regime. Therefore, any discussion related to woodchipping must of necessity include timber resources taken from State Forest. In addition, chiplogs are being and are proposed to continue to be supplied from State Forest outside of the Woodchip Licence Area and from private property.

The key issue associated with the assessment of the environmental impacts associated with WACAP's proposal is the source and derivation of the wood to be processed.

The proposal would operate within the resource commitments given in the Lands and Forest Commission's Timber Production in Western Australia strategy (CALM, 1987a) and the management strategies outlined in the Forest Region Management Plans 1987-1997 (CALM, 1987b, c, d)

The Authority has already reviewed the issues of security of tenure and purpose of areas proposed as conservation reserves in the Northern, Central and Southern Forest Regions (EPA, 1987b). Its report concluded that implementation of CALM's Forest Region plans would be a major step forward for conservation of forest in Crown ownership in the State, largely because they provide the basis for securing conservation areas initially identified in proposals for State Forest by the then Forests Department and subsequently recommended by the EPA. The proposals contained in the Management Plans were supported by the Authority, which recommended that the Management Plans be implemented.

An important context for protection of the conservation values of the reserves is the compatible management of adjacent land. For example, in accepting proposals in the Central Forest Region Management Plan for the previous buffer zones of the Dalgarup, Lennard, Mullalyup, Preston, Noggerup, Mowen, Dardanup and Blackwood River Management Priority Areas (MPA's) to remain within State Forest, the Authority recommended that these areas be managed to ensure protection of the ecological, landscape and recreation values within the reserve portion of the MPA's.

In its report, the Authority pointed out that State Forest management associated with the woodchipping industry would be reviewed by the EPA in its assessment of WACAP's licence renewal proposal (EPA, 1987b).

A number of issues were raised in submissions or identified by the Authority as requiring consideration during this assessment. These included:

- the generation of woodchips from State Forest resources;
- the environmental acceptability of the current Karri forest silvicultural practice of clearfelling;
- protection of conservation and amenity values in the multiple use State Forest including old growth forest;
- the proposed review of the existing system of Road, River and Stream Zones;
- the duration of any new woodchip approvals;
- the establishment of plantations of trees on private property;
- the clearing of remnant native forest on private property, and
- the use of sawmill wastes for woodchips.

Each of these issues has been considered by the Authority as part of its evaluation of WACAP's proposal. It has been clear to the Authority that a number of these issues are closely related and this has been considered where necessary.

In this assessment the Authority has been guided by the following principles:

1. The production of woodchips as a consequence or by-product of other legitimate forestry practices such as sawlog production or justified silvicultural practices (such as thinning) is generally environmentally acceptable in multiple use State Forest; the clearing of eucalypt forests primarily for woodchipping in its own right is not.

2. So far as possible, management of State Forest for multiple use, on which availability of woodchipping reserve depends, should remain amenable to re-appraisal in the future.

3. Management practices should be flexible.

4. Where knowledge about significant aspects of the proposal is uncertain, caution dictates that critical decisions should be conservative.

5. It is desirable to establish alternative resource bases such as plantations on private property to relieve pressure on current old growth forests.

6. Community confidence in management of the woodchip industry is enhanced where there is scope for consultation.

6.2 PROVISION OF WOODCHIP RESOURCE

The means by which the wood for chips is obtained and its source were the areas upon which the Authority has concentrated much of its attention for this assessment.

WACAP proposes to derive wood for chipping from five areas:

- low grade logs from integrated harvesting operations in multiple use State Forest;
- regrowth thinnings in multiple use State Forest;
- residues obtained after sawlogs have been milled;
- resource from plantations including those established on cleared, private property, and
- chiplogs from clearing native vegetation on private property.

The potential environmental impacts vary considerably between these different sources and accordingly the Authority has assessed them and made separate recommendations on their environmental acceptability. The five sources of woodchips are proposed to be exploited accordingl to the following schedule:

PROPOSED RESOURCE DERIVATION (BY PERCENTAGE)

SOURCE OF WOODCHIPS	% 1991-1995	% 1996-2000	% 2001-2005
1. Low-grade logs from State Forest	66	54	45
2. Regrowth thinnings in State Forest	18	30	27
3. Saw mill residues	11	11	6
4. Plantations on private property	0	0	20
5. Native vegetation on private property.	4	4	0

With time there is more timber from plantations on private property and from regrowth thinnings, but although there is less from State Forest in the future the vast majority of woodchips will be coming from State Forest.

6.2.1 INTEGRATED HARVESTING IN STATE FOREST

The Environmental Protection Authority has aimed to protect environmental values of multiple use State Forest through flexible management and thereby complement and protect the national park and nature reserve system.

It is believed that the conservation values of the multiple use forest can be maintained without the need to extend the reserve system and within the constraints of timber volumes imposed by the Timber Production Strategy.

The basis for this approach is set out below:

(a) THE FRAMEWORK OF DECISION-MAKING

State Forest provides WACAP with most of its resource. The actual proportion of resource has varied over the period of the existing licence and, according to the ERMP, this would be likely to continue during the next licence period (Figure 4).

The existing Wood Chipping Industry Agreement Act and the Forest Produce Licence provide a guaranteed resource that can be obtained from State Forest within the Woodchip Licence Area. This provides for sufficient Karri, Marri or Jarrah chiplogs to produce 670,000 tons of woodchips per annum equivalent to approximately 640,000 cubic metres of chiplogs per annum (CALM, 1987a). As mentioned previously, WACAP has also been supplied with chiplogs from State Forest outside of the Woodchip Licence Area. These supplies are not provided for in the Agreement Act and CALM is under no obligation to provide chiplogs from this source. The ERMP indicates that such supplies would be likely to increase during the next licence period of WACAP.

For this reason, any assessment of the environmental impacts of integrated harvesting operations in multiple use State Forest must also consider forestry operations outside of the Woodchip Licence Area. In addition, it has also been pointed out in the ERMP that the economic haulage distance is generally 180 km from WACAP's chipmill. This distance covers all State Forest in the Southern and Central Forest Regions, and the southern portion of the Northern Forest Region.

Accordingly the Authority is of the view that its recommendations regarding this proposal should apply to the whole of State Forest in the South West and not be confined to the existing Woodchip Licence Area.

RECOMMENDATION 1

The Environmental Protection Authority considers that there is no rational justification for confining the taking of wood chip resource to the existing Woodchip Licence Area. The recommendations in this Report should therefore be taken to refer to all of the Northern, Central and Southern Forest Regions.

(b) RESOURCE AVAILABILITY

Both the 1973 EIS and the 1987 ERMP describe that chiplogs from State Forest are derived as part of forest operations to obtain sawlogs under the integrated harvesting regime practised by CALM. In addition, the volume of chiplogs available is determined by the sawlog cut (CALM, 1987a).

Future woodchip resource made available to WACAP from State Forest would be provided for under the framework of the Lands and Forest Commission's Timber Production Strategy (CALM, 1987a). This Strategy was prepared as a supplementary document to the Northern, Central and Southern Forest Regions Management Plans, with the objective of providing a plan for a timber industry which is sustainable indefinitely while, at the same time, protecting and managing the water catchment, conservation and recreational opportunities provided by the States' forests.

The three Forest Region Management Plans, with the Timber Production Strategy, were adopted by the National Parks and Nature Conservation Authority and Lands and Forest Commission and approved by the Minister for Conservation and Land Management. The date of gazettal, 12 February 1988, is their commencement date and they apply for 10 years unless revised earlier.

Timber production is the primary use proposed within multiple use management of State Forest. The level of production of all timber types, including chiplogs, is indicated in the Timber Production Strategy. The Strategy provides details of the commitments to allowable cuts of sawlogs and other timber produce within the three Forest Regions. In each instance, the projected cut is only committed for the duration of the Management Plan (ie up to ten years), although indicative volumes are presented for a number of decades beyond 1997.

The Timber Production Strategy also presents the rationale upon which the allowable cuts of sawlogs in the three Forest Regions were derived. A principle objective was to define a cut based on achieving sustained yield from the State Forest in the long term (CALM, 1987a p 28).

Sustained yield involves arranging the future timber harvests from State Forest in such a way as to ensure that a range of log sizes is available each year (CALM, 1987a p 28). This requires the age distribution of the forest to be compatible with the desired log sizes. The Timber Production Strategy indicates that this is not so in the hardwood forest. As a consequence, there is an overall strategy by CALM to undertake harvesting and management in the short term in such a way as to achieve a suitable age distribution and sufficient area of trees through the State Forest. This Strategy is outlined in Part 5 of the Timber Production Strategy.

Information presented in the Timber Production Strategy indicates that forest harvesting operations in the hardwood forest, including that in the Karri forest, is currently being undertaken in ways which will permit sustained yield in the future. The principal reason presented in the Strategy for not operating on a sustained yield basis in terms of log sizes relates to previous harvesting patterns. Harvesting programmes will emphasise logging of old growth forest in the short term. However, CALM has indicated that the volume of logs removed from State Forest each year will not exceed the volume of timber grown within State Forest each year (CALM, 1987a p 37).

The Timber Production Strategy indicates that the cut of old growth logs from some areas of the State Forest will progressively decline until a sawlog yield that can be indefinitely sustained is reached (CALM, p 37).

The allowable Karri sawlog cut for the Southern Forest Region has been determined in the Timber Production Strategy to be 168 000 cubic metres for the first two years and 153 000 cubic metres for the remainder of the period of the Management Plan. The annual Jarrah sawlog cut in the region is 150 000 cubic metres until 1995, then 100 000 cubic metres until expiry in 1998. In the Central and Northern Forest Regions, the annual Jarrah sawlog cut is 309 000 cubic metres until 1992, then 250 000 cubic metres until 1995 and 200 000 cubic metres to 1998.

Derivation of those sawlogs will generate the following levels of Karri and Marri chiplogs:

1988 -1990, 583,000 cubic metres
1991 -1995, 553,000 cubic metres
1996 -1998, 442,000 cubic metres

It is important that chiplogs from old growth forest are only available as a residue of integrated harvesting operation for sawlogs.

The rationale for this is to prevent additional pressures being applied to derive resource from old growth forest because of changes in supply from other sources, for example, reduced resource availability from sawmill residues caused by other woodchip industries based on this supply being established. Such additional pressures could reduce options in the future for managing the old growth forest areas.

The EPA's position regarding the Timber Production Strategy and the Forest Region Management Plans is that it endorses the approach taken to balance conservation and production areas within the Forest Regions (EPA, 1987) and it notes the quantities of resource contained in the Timber Production Strategy. With these mechanisms in place to ensure the security of tenure and purpose of both the conservation and multiple-use forest estates, the remaining outstanding issue is management of the multiple-use areas of State Forest. The Authority will consider the environmental consequences of how timber resource is to be supplied.

RECOMMENDATION 2

The Environmental Protection Authority notes the volume of woodchip from old growth forest described in the Timber Production Strategy. The Authority recommends that this be strictly observed.

(c) THE PRINCIPLE OF FLEXIBLE MANAGEMENT

Within the portion of the Forest Regions classified as State Forest, management will be implemented on a multiple use basis. Multiple use management is undertaken such that, provided the forests are managed efficiently, the forest can continue to be used for a wide variety of purposes, some simultaneously, others at different points in time. These multiple uses include conservation, recreation and production (CALM, 1987a). The Timber Production Strategy defines multiple use as:

> "The use of land, especially forest land, for several different purposes. Some types of use are compatible with each other, but others may not be compatible, in which case it is necessary to set a priority or even exclusive use for a particular area." (CALM, p 77).

The potential conflict between the various uses is recognised in the Timber Production Strategy. The Strategy indicates that:

> "Multiple use does not necessarily mean all uses can be practised at the same time in the same area. Some forest uses will never be compatible - for example, timber production and preservation of old growth virgin forest. Incompatible uses must be provided for on separate areas of forest. This is what the regional land use plans propose to do. Other uses may be compatible, but must be separated in time to prevent conflict between users, for example timber production and recreation.
>
> Uses of a forest will vary with the type of forest, its location and its history. Often there is no conflict between a variety of uses and, in some situations, different uses benefit each other. but often it is necessary to specify a priority use. The priority or dominant use of an area is determined by the attributes of the forests and the level of demand for

different uses. A priority use does not mean the area is used only for that purpose. However, where there is conflict between different uses, the priority use is given more consideration.

Because State forest is managed for multiple use, it makes a major contribution to meeting the demands for conservation and recreation additional to the forests set aside as national parks and nature reserves." (CALM, p 29)

Thus the multiple use concept implies management for wider range of objectives than timber production alone. The wider range includes protection of water resources, provision for public access for various forms of vegetation and protection of the conservation values of landscape, flora and fauna. Though it is primarily committed to production, commercial exploitation within the multiple use forest must be under some degree of constraint if the term is to have any real meaning.

The concept also recognises the way in which the characteristics of the forest vary over the ground, partly in response to changing site conditions and partly in response to harvesting and other treatments in the past. Thus suitability for productive use will also vary, as will sensitivity to environmental damage, and to diminution of conservation nor amenity values. The task of the forest manager is to take account of these varying factors, formally in zones or guidelines indicating changing management priorities, and less formally and at a more detailed level in the control of day to day operations.

The wider uses of multiple use forestry include protection of the values of identifiable areas of high value old growth forest. It is the discretionary aspect of how and when to allocate the resource to be supplied from production areas in State Forest which primarily allows for future options to be preserved for these areas beyond the current resource commitments in the Timber Production Strategy which is to be reviewed again in 1998.

It would be premature for the State to commit itself irrevocably at this point in time for all remaining old growth forest to be harvested by clearfelling when other options exist through a flexible management regime.

Flexibility in management is already an operational policy used by the Department of Conservation and Land Management in treating areas such as buffers around wetlands and granite outcrops in the Karri forest and is proposed by CALM as part of a technique to enable fauna movement across geographical saddles linking stream headwaters. In these areas only thinning occurs. Extension of the flexible management approach is proposed by CALM as the basis of reviewing the Road, River and Stream Zone system in the Southern Forest Region (CALM, 1987b).

The Southern Forest Region Management Plan (CALM, 1987b) contained a proposal that the existing Road, River and Stream Zone system within the region would be reviewed

".. with the objective of improving their efficiency in providing amenity, wildlife habitat and stream protection. "(CALM, p 11)

A commitment was given in the Management Plan that no changes to the existing system would be made without evaluation and approval by the Environmental Protection Authority. There is also a commitment that there will not be a reduction in the overall area of Road, River and Stream Zones.

CALM has prepared its review of Road, River and Stream Zones and has recently referred its proposals to the Authority (attached).

The review has proposed that the area of the zones be redistributed to provide for more protection of 1st and 2nd order streams. In addition, provision for selection logging in road zones and a portion of river zones has been proposed. The main elements of CALM's proposals are presented in summary form in Table 3.

Table 3. Proposals in the Review of Road, River and Stream Zones.

ZONES	PRESENT	PROPOSED
Rivers	5th order 200 m buffer either side. No cutting	5th & 4th order 100 m buffer either side. Selective cutting in outer 50 m.
Streams	4th order rivers & 3rd order streams and some 2nd order streams 100 m buffers either side. No cutting.	3rd, 2nd & 20-30% 1st order streams 50 m buffers either side. No cutting.
Roads	Selected major/ tourist roads 400 m buffers either side. No cutting.	Selected roads and amenity areas or portions of roads with buffers averaging 200 m either side. Selective cutting.

(Source : CALM)

The setting aside from logging of the system of Road, River and Stream Zones was a key commitment by the then Forests Department in its 1973 EIS on the Marri Woodchip Project. Since then, their protected conservation and other environmental values have been frequently used to defend public comment and criticism about aspects of forest management and harvesting. Further, there has been close public scrutiny and interest in the research carried out by the Steering Committee for Research on Land Use and Water Supply, into the value of and need for such vegetated zones. The Authority is also aware of concern expressed in submissions relating to the maintenance of the existing system and its expansion to include 1st order streams.

The Department of Conservation and Land Management proposal is attached for information and is valuable background. The Authority therefore has recommended that the proposal be developed in detail in consultation with the public, and that it then be referred for assessment by the Authority.

In considering the future management in the Karri Forest, the Authority has, however, carried out a preliminary assessment of the proposal. As part of this assessment, officers of the Department of Conservation and Land Management briefed the Authority on the technical mechanisms which could be applied to optimise environmental values provided there was scope to be flexible in allocation of management to different parts of the forest. The

Authority was impressed by the possible advantages of this approach and by the competence of the CALM officers who proposed it.

The Authority accepts the principle of this flexible approach to Road, River and Stream Zones and supports the extension of this principle within multiple use State Forest as a central management tool for protecting conservation and environmental values in all the sensitive areas of State Forest from which woodchips could be derived. The extension of the principle should be included in the proposed review of Road, River and Stream Zones.

The Road, River and Stream Zone system has yet to be applied to the remainder of the State Forest beyond the Woodchip Licence Area. This is an issue that should be and is proposed to be reviewed by CALM.

The Authority, in examining the environmental implications of management for multiple use in State Forest notes that the conservation reserve system in the forest estate secured under the Forest Region Management Plans was established and depends upon compatible management of the State Forest. In addition, multiple use State Forest has a range of values as identified in the Timber Production Strategy, for example tourism, apiculture and wildflowers.

A most important issue raised in public submissions concerned the need to conserve some of the old growth forest areas in State Forest. In addition the need to provide for minor and specialised forest industries such as the production of honey, and bees for export, was consistently recognised.

The Authority proposes the extension of the flexible approach to the management of areas of high value, old growth forest in multiple-use State Forest within the Southern Forest Region. The Authority is referring to those portions of forest that have especially high value and which tend to be concentrated in the old growth forest areas. The Authority considers that the flexible management principle which CALM applies to Road, River and Stream Zones and other high conservation areas within the forest such as wetlands and rock outcrops could and should be applied to the old growth forest within the Region.

The most outstanding or special parts of high value old growth forest are identified from the following attributes:

. ecological systems which are not represented or poorly represented in reserves;

. especially valuable components of fauna habitat (for example, an area with trees containing a high proportion of nesting hollows for birds);

. areas containing rare or endangered species;

. areas having special significance such as:

  - readily accessible and used by people for recreation, and

  - landscape amenity, that is viewed from areas frequently visited by people;

. areas which complete linkages between reserves (for example, bridges gaps between the end of a road, river or stream zone and a conservation reserve);

- areas which require special management to protect adjacent conservation areas; and

- areas which have high recreational or amenity value such as picnic spots, tourist trees and exceptional scenic areas.

The Authority believes that by flexible management these areas with high conservation and amenity values can be protected in old growth forest without further reservation and within the constraints imposed by the Strategy.

The Authority therefore proposes that the review of Road, River and Stream Zones be extended to include how flexible management could be applied in areas of high value old growth forest. This will mean:

- The Department of Conservation and Land Management identifies and delineates on maps those special areas of high value old growth forest, for example, parts of Jane block and Hawke block, as well as locations such as areas around picnic spots and look-out trees frequented by the public at the same time as it is determining its preferred Road, River and Stream Zones. This process should involve public consultation; and

- The Department of Conservation and Land Management proposes a flexible management regime for these special areas and zones to protect their conservation and amenity values whilst providing for some harvesting and other productive uses. The Authority envisages that clearfelling would not occur in these special areas and zones.

The whole proposal would be subject to environmental impact assessment by the Authority. In the interim no cutting in Road, River and Stream Zones would occur.

This approach recognises that conservation and environmental values vary within the old growth forest of the Region, and that the portion of the old growth forest having the highest values should be managed in a manner that is compatible with those values. Within this area, harvesting could be compatible although clearfelling would not. In addition, a part of that forest in the Southern Forest Region would be expected to have retained such exceptional values that it should be preserved from any logging.

RECOMMENDATION 3

The Environmental Protection Authority accepts in principle the proposal by the Department of Conservation and Land Management to introduce flexible management to Road, River and Stream Zones. The Authority accepts that these zones should be redistributed and managed to protect the values for which they are intended. ie. in Road Zones these will include, principally, the protection of visual amenities and the provision of faunal refuges, and in Stream Zones, protection against silt and salt impacts and also the provision of faunal refuges.

The Authority recommends that the Department of Conservation and Land Management consult with the public to develop a detailed proposal for Road, River and Stream Zones to be submitted to the Environmental Protection Authority for environmental impact assessment. No cutting of Road, River and Stream Zones should occur in the interim.

RECOMMENDATION 4

The Environmental Protection Authority recommends that the Department of Conservation and Land Management, as part of the review and referral to the Authority of Road, River and Stream Zones, be required to identify within old growth State Forest:

. additional areas of high value old growth forest meriting special treatment in the sense that they should be managed and harvested flexibly rather than be subject to broad-scale clearfelling; and

. areas which should be excluded from harvesting to protect their exceptional scenic, faunal, and other amenity values.

A scheme of management for these special areas should be proposed.

(e) INTEGRATED HARVESTING IN JARRAH FOREST

The ERMP indicates that there is likely to be a significant increase in the volume of chiplogs supplied to WACAP from State Forest located outside of the Woodchip Licence Area through the remainder of the existing licence period and into the next licence. The potential yields from State Forest outside of the Area are set out in Table 19 of the ERMP and indicate that WACAP could receive approximately 113,000 cubic metres per annum between 1987-1995 and 106,000 cubic metres per annum between 1996-2005 from this source (WACAP, p 101). This compares with actual total supplies from State Forest outside of the Woodchip Licence Area of 47,539 cubic metres, at an average of approximately 7,900 cubic metres per annum (WACAP, p 37).

This demand is only one factor in an increasing intensity of extraction of produce from the Jarrah-Marri forest. Other products besides saw and chiplogs include poles, firewood and wood for industrial uses such as the making of charcoal.

The Department of CALM has responded to these pressures on the forest by developing a procedure of integrated harvesting which minimises the number of occasions on which access to the forest is needed for extraction of wood products. Operations are designed so that extraction procedures result in the removal of thinnings and culls which is an essential part of a complex and sophisticated silviculture system. Thus the treatment applied within a single coupe is varied depending on the variation in forest conditions. Originally designed for the virgin Jarrah forest of the Pemberton-Walpole area (Bradshaw 1986), it has been modified for use in other areas where different forms of exploitation in the past have imposed further variation in forest conditions over and above that due to environmental conditions (Bradshaw 1987). Within any coupe in these forests there will be areas where the stand is even aged due to clear falling in the past, grouped by age classes from group selection cutting, uniform after single tree selection cutting,, or virgin with a variety of structures. The silvicultural system which as evolved for the treatment of these highly variable forests contains elements of several classical systems, including clear felling, group selection, and uniform and grouped shelterwood (Bradshaw 1986).

The silvicultural objective is to reduce competition in the stand so that revegetation in the form of lignotuberous seedlings and coppice can advance and develop into the pole and tree stage. (Where regeneration is absent and insufficient, seeding and planting may take place.) This is achieved by partial or complete removal of overstorey trees, some of which will be

marketable, others retained for growth, to be removed in later thinnings, or as final crop. Standing overstorey trees which are not marketable are generally culled by poisoning to an extent limiting by cost. Growing demands for firewood or charcoal means that the culls become marketable, so that the operation is an economic one, and can be applied to more areas of the forest.

The experimental coupes in the Southern Forest Region have now been monitored before and after timber harvest. Results show that regional water resources can be protected by measures such as appropriate retention of stream buffers. The Steering Committee responsible for the research has made recommendations leading to additional precautions such as the development of techniques for identification of salt sensitive areas. These are most likely to be found in the intermediate rainfall zone with average rainfall of 900-1100 mm.

As extraction of chiplogs for the WACAP project extends to the more northerly forests it passes beyond the limits of the geographic area in which the monitoring has taken place, and within which the provision for stream buffers is an established part of planning by the Department of CALM.

Conditions in the more northerly forests are similar in respect of soils, salt storages in them, and climate. The monitoring programme in the south, and a great deal of hydrologic work in the north, undertaken for other reasons, suggests that responses to overstorey removal will be similar. Nevertheless, the technique and its results on water resources have not been specifically tested there.

The Environmental Protection Authority has taken a conservative approach to the question of extension of intensive logging into salt-risk zones of the Jarrah and Marri forests. This conservatism has been based not only on the scientific assessment of salt-risk, but takes accounts of concern on ecological and amenity impacts. Furthermore, the Authority expects that decisions on intensive logging in the salt-risk parts of water supply catchments are of sufficient public interest to warrant the opportunity for public involvement before decisions are made. The Authority also has concern that special parts of Jarrah and Marri old-growth forest are given the same consideration for flexible management as for the Southern Forest Region.

This Region has river catchments which are not yet dammed for water supply. It is also the region where there has been specific research on silviculture thinning of jarrah-marri forest down to the low value of 5 square metre basal area of trees per hectare. There are also established stream buffers.

Accordingly, the Authority has recommended that there could be increased intensity of harvesting in salt-risk zones of Jarrah-Marri in the Southern Forest Region, but only after preparation of an Environmental Management Programme (EMP) to the satisfaction of the Authority. This EMP would need to detail the nature and location of harvesting proposals, the safeguards which would be taken, the monitoring which would occur, and the mechanisms for response should monitoring shown any impact.

In the Jarrah-Marri forests of the Central and Northern Forest Regions, which are closer to major population and have fresh water rivers dammed for water supply, the Authority has recommended the need for a formal review. Accordingly, the Authority has recommended that only a continuation of selection cut harvesting be permitted in the salt-risk zones of the Central and Northern Forest Regions.

The Authority has also recommended that any proposals to harvest this area more intensively should be referred to the Authority for formal assessment including public review.

With the significant expansion of the area of supply of chip logs from State Forest to WACAP, and the ongoing pressures for resource throughout the hardwood forest, the Authority considers that a research programme to address concerns raised by these changes is necessary. The Authority believes that the Steering Committee for Research into Land Use and Water Supply has provided an effective and competent avenue for such research and proposes that it prepare and coordinate such a research programme.

In the portion of the Jarrah Forest in the low salt-risk zone (ie above 1100 mm rainfall) the intensification of harvesting along the lines described by Bradshaw (1986, 1987) could continue, provided a programme to monitor water quality, soil impacts and flora and fauna impacts was implemented.

RECOMMENDATION 5

The Environmental Protection Authority notes the evolution of more intensive systems of harvesting in the Jarrah-Marri Forest. The Environmental Protection Authority recommends that there should only be continued selection cut harvesting from the salt-risk zones of the Central and Northern Jarrah-Marri forests. Any proposal to harvest this area more intensively should be referred to the Authority.

The proposal to supply WACAP with Marri resource in the salt-risk zones of the Southern Forest Region should be preceded by preparation of an Environmental Management Programme (EMP) to the satisfaction of the Authority. The EMP would need to give prior details of salt-risk areas to be harvested, harvesting methods and safeguards to be applied, monitoring techniques which are proposed, and feed-back mechanisms which would be used if salt impact were found.

(f) FOREST DISEASES

A significant concern regarding Jarrah-Marri harvesting is the control of dieback. This issue was prominent in submissions on the ERMP. From comments made in submissions, the main concern about forestry operations leading to the spread of dieback appears to be related to the enforcement of control prescriptions rather than the prescriptions themselves.

The Timber Production Strategy points to some recent advances toward the identification of susceptible sites and indicates that the:

> "intensive disease management programme and further research on site susceptibility will ensure that the disease can be contained." (CALM, p 31)

Submissions also expressed concern about the spread of Armillaria.

While the Authority makes no specific recommendations on forest diseases, it is important that there be continuing research into and effective control of forest diseases, not only for timber production but also for protection of the Karri and Jarrah-Marri forests environmental and conservation values.

(g) CONCLUSION

The use of resource from integrated harvesting operations in multiple use State Forest for woodchips, as modified to take into account the Authority's specific recommendations in this Report, is environmentally acceptable.

6.2.2 THINNINGS FROM STATE FOREST

It is proposed in the Timber Production Strategy that an increasing proportion of the State Forest resource available to WACAP would comprise regrowth Karri and Marri logs (CALM, 1987a). The projected increase is illustrated in Figure 4.

These logs would generally be obtained from sites that have been subject to previous clearfelling and would result from thinning of the regenerated forest. These thinning operations are subject to CALM's normal harvesting prescriptions.

Provided that these prescriptions are applied and enforced, the Authority considers that thinning of regrowth Karri and Marri stands is environmentally acceptable.

RECOMMENDATION 6

The Environmental Protection Authority concludes that the production of woodchips using thinnings from multiple-use State Forest is environmentally acceptable and recommends that it could continue.

6.2.3 WOODCHIPPING OF SAWMILL RESIDUES

Woodchips derived from sawmill residues are an important part of the resource available to WACAP. Since 1976, this source has contributed a total of approximately 900,000 cubic metres of woodchips, with a peak supply of 154,000 cubic metres in 1980/81 and averaging 81,651 cubic metres per annum (CALM/Forests Department Annual Reports). The majority of the residues have been derived from Karri sawlogs.

Over the period of the next 15 years, WACAP expects that sawmill residues input will decline (Figure 2).

The potential alternative uses of sawmill residues include firewood, woodchips or being burnt at the mill. There is a limit to the size of the firewood market and it would not include boxed hearts. Burning of the residue means the loss of the value of that resource and this has historically led to sawmill preference for only the highest quality timber being sawn. Woodchipping provides a value to the residues and potentially allows lower quality logs to be sawn.

Provided the residues are solely derived from sawn logs from which timber has been cut and no whole sawlogs are chipped, the Authority is of the view that the use of sawmill residues for woodchips for either local or export use is environmentally acceptable. This is the position stated in the Authority's "Environmental Guidance for Land Use and Development in Southern Western Australia" (EPA, 1988). It is considered to be more beneficial to use sawmill residues for woodchips than that they be burnt.

RECOMMENDATION 7

The Environmental Protection Authority concludes that the chipping of residues from sawlogs is environmentally acceptable and recommends that it could continue.

Submissions on the ERMP indicated that sawmill residues could be processed to woodchips. These submissions also pointed their preference for the local use of the woodchips.

Of relevance to this assessment are proposals by two sawmills in Western Australia to separately apply to the Commonwealth Government for licences to export sawmill residue in the form of woodchips. Each has made application to export up to 50,000 cubic metres per annum. The sawmills which would source these woodchips currently supply WACAP with woodchips or solid wood. These proposals will be assessed by the EPA.

The loss of these sources of woodchips to WACAP could have an effect on the woodchip resource available to the Company and may lead to pressure to gain access to alternative resources. In section 6.2.1 of this Report, the Authority has detailed its position on this matter.

6.2.4 PLANTATIONS ESTABLISHED ON CLEARED PRIVATE PROPERTY

The ERMP describes four landowner agreement schemes for operations by WACAP on private property. One of these schemes, the Tree Farmer Scheme for Farmers Wishing to forest a Pasture Land, applies to previously cleared land. Under this scheme, the landowner agrees to WACAP being given first right of refusal of any plantation timber in return for WACAP supplying seedlings, fertiliser, equipment and advice. Up until 1988, only two such agreements had been reached, covering 15 ha (WACAP, p 80). Another scheme, which is a Lease Agreement, applies to land where the landowner and WACAP jointly contribute to initial plantation establishment costs. Only one agreement covering 10 ha is reported in the ERMP.

In addition to these schemes, WACAP has established plantations on 200 ha of its own previously cleared land (WACAP, p 84). It is stated in the ERMP that the conversion of cleared land is WACAP's preferred method of plantation establishment (WACAP, p 84)

WACAP expects to export 180 000 cubic metres annually of Eucalyptus plantation derived woodchips commencing in 2001, with smaller volumes available during the late 1990's. This would be sourced from the 10 000 ha of plantations that the Company expects to have established by 2003, with planting at an annual rate of 600 ha for the next 14-15 years. Plantations would be located on land having an annual rainfall in excess of 800 mm.

The main environmental issues associated with plantations are:

(a) the potential to correct salinity caused by clearing;

(b) the possible reduction in water volumes in streams when plantations are concentrated in high rainfall areas;

(c) the placement of plantations in the landscape in low rainfall areas (less than 900 mm) to maximise water quality benefits; and

(d) effects related to harvesting on water quality.

At present, there is no State mechanism for approving or controlling plantation operations on private land. While there are significant potential environmental benefits to be obtained from their establishment, some measure of control may be appropriate:

- to ensure that the benefits are realised where possible and disbenefits minimised; and

- to address any future Commonwealth Government concern where approval is subsequently sought to export the plantation resource in the form of woodchips.

In submissions on the ERMP, there was strong support from conservation groups and individuals for woodchips for export to be sourced completely from plantations established on cleared land.

The Authority strongly supports initiatives relating to the establishment of plantations on cleared private land. The Authority's report on the McLean Forest Project pointed to the benefits of the revegetation of cleared land (EPA, 1987a). In its recent publication "Environmental Guidance for Land Use and Development in Southern Western Australia" (EPA, 1988) the Authority has indicated that:

> "the environmental impacts of plantations can be made wholly beneficial by appropriate selection of sites and that if this is done then there should be no environmental concerns from the removal of trees at the time of harvesting:" (EPA, p 14)

As a consequence, the publication concludes that:

> "Plantations of trees on previously cleared land will be found, in general, environmentally acceptable, and indeed may provide an enhancement of existing environments." (EPA, p 14)

In the long term, there is the opportunity for plantation derived resource to fully supply any woodchip or pulpwood industry in Western Australia. Industry and the State Government should continue to encourage and promote opportunities which could permit this potential to be realised.

RECOMMENDATION 8

The Environmental Protection Authority concludes that chipping of resource derived from plantations established on cleared private property is environmentally acceptable, although plantation establishment would still require appropriate management to maintain water quality and quantity and other environmental objectives, and recommends that the State continues to encourage plantation establishment.

RECOMMENDATION 9

The Environmental Protection Authority recommends that the State develop a way by which proposed Eucalyptus plantations be located to optimise environmental benefits.

6.2.5 CLEARING OF REMNANT NATIVE VEGETATION ON PRIVATE PROPERTY

As the decline in the area of remnant native vegetation on private property has become more apparent in recent times, so have the conservation and other environmental values of the remaining area increased.

The Authority summarised the main reasons for conserving remnant native vegetation in its assessment report on the McLean Forest Project (EPA, 1987a). In that report, the Authority also highlighted the significant decline in the area of this vegetation in the Shires of Albany, Plantagenet, Denmark and, to a lesser extent, Manjimup (EPA, p 12). Advice received from the Commissioner for Soil Conservation indicates that clearing has continued since that report. The Department of Agriculture received 172 Notifications of Intent to Clear under the Soil and Land Conservation Act during the period January 1986 to April 1988, involving 8169 ha of private property within the Shires of Albany, Plantagenet and Denmark and Town of Albany.

The continued loss of this native vegetation is of considerable concern to the Authority. The Authority did not recommend against the McLean Forest Project in order that another industry could proceed to take the limited resource.

Approximately 7880 ha of private property clearing provided chiplog resource to WACAP in the period 1976-1986. The ERMP estimates that the end use of this land was eucalypt plantation (880 ha), pine plantation (400 ha) and agriculture (6600 ha) (WACAP, p 82). Clearing of this land provided a total of approximately 480,000 cubic metres of chiplogs, averaging 53,000 cubic metres per annum and 61 cubic metres per ha (Figure 5).

The ERMP indicates that the resource obtained from logging of private property native forest would be expected to decline and cease during the next licence period. While no reason for this reduction is presented in the ERMP, it could reflect the diminished extent of the remnant native forest remaining after a further 12 years of clearing. WACAP expects to purchase logs from 9484 ha of private property between 1987 and 2000 (WACAP, p 34). This is a larger area than that involved with WACAP's past operations.

WACAP operates on private property within an economic operating distance of about 180 km from the chipmill, but this can be increased to 300 km with backloading. The potential area from which private property resource can be obtained and within which impacts could occur is, therefore, substantially larger than that proposed in the McLean Forest Project.

The Authority does not accept the argument presented by WACAP in the ERMP that, by paying a low royalty for the chiplogs removed from private property, the company does not contribute to the clearing of remnant native forest.

Existing legislative controls on clearing operate under the Country Areas Water Supply Act and the Soil and Land Conservation Act. The former only applies in designated areas. While these Acts would appear to offer sufficient controls in relation to land and water degradation during clearing within designated catchments or areas, they do not have as their prime statutory objectives the protection of conservation and other environmental values of remnant vegetation.

In addition to these two Acts, there are also vegetation protection provisions that can be imposed, though only to a limited extent, under planning legislation.

In its "Environmental Guidance for Land Use and Development in Southern Western Australia", the Authority has indicated that an appropriate environmental objective is:

"To retain and manage remnant native vegetation." (EPA, p 12)

This objective implies that any clearing of remnant vegetation would need to be fully considered prior to being undertaken. At present, not all of the relevant issues, such as conservation implications, can be formally considered.

The Authority proposes the following review strategy to protect remnant native forest on private property.

The Authority acknowledges that controls currently operate under the Soil and Land Conservation Act and the Country Areas Water Supply Act. However, their statutory responsibilities do not readily permit broad environmental values to be recognised. It is the Authority's view that the State Government should prepare a policy which encourages and facilitates the protection and management of remnant native vegetation. The preparation of such a policy should include wide community consultation. The Authority understands that it is already Government policy that there should be no clearing of areas of native vegetation for the purposes of establishing plantations.

There are a number of options available to the State Government for the preparation and implementation of such a policy. The development of a policy could be accommodated by, for example, the provisions of the Environmental Protection Act involving an Environmental Protection Policy.

It is clear to the Authority that the area of private property from which WACAP purchases chiplogs is relatively significant in the region. As a principal purchaser of private property resource, review of the chiplog intake from this source could assist in the protection of areas of remnant native vegetation with high conservation and other environmental values. Accordingly the EPA has concluded that the use of material derived from remnant native vegetation clearing on private property is environmentally unacceptable. There may, however, be exceptions to this situation and a mechanism to allow for them has been proposed involving the Minister for Environment in the decision-making process. In addition, the Authority has recommended that a State Government policy be developed for the protection and management of remnant native vegetation on private property.

The main emphasis for establishment of plantations is on previously cleared private property, but native vegetation should not be removed for the specific purpose of developing plantations.

The Authority considers the clearing of native vegetation on private property for plantations to be environmentally unacceptable.

RECOMMENDATION 10

The Environmental Protection Authority concludes that clearing of remnant native vegetation on private property for the purpose of producing woodchips is, in general, environmentally unacceptable. The Environmental Protection Authority recommends that this not be permitted except for individual exceptions authorised by the Minister for Environment.

RECOMMENDATION 11

The Environmental Protection Authority concludes that the clearing of remnant native vegetation on private property to establish plantations is, in general, environmentally unacceptable and recommends that it not be permitted except in individual cases authorized by the Minister for Environment.

RECOMMENDATION 12

The Environmental Protection Authority recommends that the State Government develop a policy for the protection and management of remnant native vegetation on private property. This policy should include recognition of the landscape, water quality and quantity, soil protection and conservation values of remnant native vegetation, as well as their potential for management as a productive resource.

6.3 WOODCHIP PRODUCTION AND EXPORT

The existing WACAP woodchip mill is located approximately 11 km south of Manjimup. At this site, logs are processed to chips and either stockpiled or loaded onto trains for transport to Bunbury, from where they are exported.

Transport of logs to the mill is undertaken by truck, with the majority of the logs being moved along private roads. Some concerns were expressed in submissions about two aspects of this transport. The first related to public safety for roads users in the event that log trucks did not comply with relevant traffic codes. This is a concern that needs to be addressed by WACAP and road traffic authorities. The second concern reflects elevated turbidity and sediment levels in streams near bridges and culverts established along the private road system. Discussions between CALM and the Water Authority of WA should take place to ensure that road design and management minimises this problem.

The woodchip mill was designed to process logs with a minimum length of 2.1 metres and a minimum diameter of 230 millimetres. While it has been possible to process Karri logs of a smaller dimension, the need to debark Marri has not permitted logs of that species within specification to be processed. It is understood that this has resulted in a significant volume of Marri logs not being chipped even through they are within the correct size. The ERMP indicates that a second but small woodchipper may be installed at the chipmill, to process smaller logs and sawmill residues.

There would be clear benefits for increased utilisation of all portions of the trees that are unsuitable as sawlogs. It is recognised that technology in sawing logs is improving, with increasing diversion of lower quality logs to sawmills. With this gradual change, there is also the related need to ensure that as much of a felled tree as possible is processed, either as sawlog or chiplog. As with the sawmills, WACAP should take advantage of improved technology and the replacement of equipment to continue to improve the overall proportion of each tree that is processed. In particular, the limitation at the mill in processing Marri logs needs to be overcome.

One topic that has been subject to long debate and was raised in submissions was the need to ensure that only wood unsuitable as sawn timber should be chipped. Logs that are directed to the chipmill may still contain a portion of wood of sawmill quality. CALM has proposed that a sawmill be established close to the chipmill to cater for this opportunity. The Authority considers that further encouragement should be given to ensure that logs with sawn timber potential are not chipped until the sound wood has been removed.

WACAP has put forward proposals in the ERMP to manage the environmental impacts associated with the chip mill and transport and export the chips. Commitments relating to these proposals are presented in Appendix 3. The Authority considers that these are generally environmentally acceptable.

6.4 TIMING OF APPROVALS AND REVIEWS

The ERMP proposes that existing State approvals, ie. the Wood Chipping Industry Agreement Act and the Forest Produce Licence, should be renewed for the next licence period, which WACAP indicates should be 15 years. This is the period of approval in principle that has been given by the Commonwealth Government to other major woodchip exporters.

As the principal resource supplies to WACAP are from State Forest, the planning horizons of the Lands and Forest Commission, which has statutory vesting and control of State Forest, provides an essential context for this continued operation. It was for this reason that the Authority's assessment of the ERMP was deferred until the Forest Region Management Plans were finalised. These Plans have a statutory duration of up to 10 years, and can be revised before then. The recently approved Management Plans expire in February 1998.

WACAP's existing approvals expire on 10 May 1991. A 15 year licence would therefore bring the following licence period commencement to May 2006. This date would be beyond the existing Management Plans and just prior to the next Management Plan period. There should be close links between the approval period for WACAP and the planning and management horizon that applies to the State Forest resource. In particular, State approvals should be linked to the timetable for review of the Timber Production Strategy and Management Plans. This will allow those Plans to take account of environmental aspects of woodchip resource supply.

The Authority believes that although planning for timber resources requires a long time horizon there are significant uncertainties in environmental impact which mean that the basis for decisions on the forest should be reviewed frequently. These uncertainties include global climate change, long term effects of forest management on nutrient cycling, water quality, plant diseases, pests and flora and fauna composition. Prudent management needs to consider these factors as well as commitments based on timber yields predicted late next century, particularly as there is a real possibility of alternative resources being available from for example private plantations being preferred at that time. The Authority believes its conclusions and recommendations covering the next 10 years allow options to be kept open to allow for unpredictable circumstances in that period and over the next century.

RECOMMENDATION 13

The Environmental Protection Authority concludes that State Government approvals, including the Forest Produce Licence, for WACAP's woodchip operations based on State Forest resource should be linked specifically to the duration of the Timber Production Strategy and Forest Region Management Plans and recommends that State approvals be reviewed at the expiry of the present Management Plans, which is currently planned for February 1998.

7. ENVIRONMENTAL MONITORING AND MANAGEMENT

As WACAP would be receiving resource from State Forest and private property plantations, any research and review of operations must also take this division of resources into account, not least of all because of the differing involvement and responsibilities of WACAP and CALM.

The ERMP presents details of research and monitoring activities and responsibilities. The Supplement provides a long list of management commitments by WACAP. These commitments are provided in Appendix 3. In relation to those commitments given for State Forest operations, it needs to be reiterated that the Lands and Forest Commission and CALM have statutory responsibility.

As mentioned previously, the emphasis of research into the woodchip industry has been related to improvements in Karri forest silviculture and protection of water resources within the Woodchip Licence Area. However, in recent years, CALM has broadened its research interests to include more investigation into the flora and fauna of the Karri forest. This change in the balance of research in the Karri forest is supported, particularly where it leads to better understanding of the ecology of the Karri forest and how the range of forest management practices might affect it.

Likewise, more research emphasis should be placed on gaining a better understanding of the ecology of the Jarrah forest and how ecological relationships are or could be affected by forest management. This is especially relevant with the extension of integrated harvesting throughout the hardwood forest.

The concerns of the Authority about intensification of harvesting in the low and intermediate rain forest zones of the Jarrah forest stem, in part, from a lack of comprehensive research into associated problems. Uncertainty about environmental impacts of harvesting is not, of course, confined only to this area. While research has led to a considerable increase in knowledge since the woodchip industry was first assessed in this State, on-going, systematic research is still required in multiple use State Forest. The Authority has made recommendations aimed at ensuring that environmental impacts are managed and monitored. Research should include the predicted impacts of climatic change on the forest estate.

This research would significantly assist the Authority when the future reviews of the woodchip industry are undertaken.

While WACAP has pointed to the extensive research undertaken since 1976, many investigations have been deferred and they now need to be implemented.

There are a number of specific areas that need addressing. These include:

- improved understanding of aquatic fauna of the Karri forest;
- complete an inventory of flora of the Karri forest;
- forestry management practice impacts on long term flora and fauna composition in the Karri and Jarrah forest;
- the effect of continued logging on nutrient status and cycling in the forest;
- the effect of fertiliser application in the forest on vegetation and fauna and water quality;
- the ecological implications of the forest as affected by disease and pests, and
- the effects of climatic change.

These specific research needs arise as a consequence of managing the State Forest for multiple use. It would be appropriate for forest resource based industries that are benefiting from this multiple use to contribute to funding this research. WACAP currently participates in some cooperative research and this is considered to be desirable.

RECOMMENDATION 14

The Environmental Protection Authority recommends that research on the effects of intensive extraction of wood products in both the Jarrah-Marri and the Karri forest be expanded to give greater priority to the impacts on ecological (conservation) and recreational values.

The Environmental Protection Authority further recommends that the detailed objectives and priorities for research into the environmental impacts of the proposal be determined by the Steering Committee for Research on Land Use and Water Supply after wide consultation. This Committee should have amended terms of reference and composition accordingly.

The Authority considers that it would be appropriate for forest resource based industries to participate in, or contribute to, this research.

An important component of the environmental assessment of a proposal is the modification of management to take account of impacts. This iterative process is essential to ensure that environment impacts are minimised and acceptable and also provides information which can be used in future decisions.

The EPA holds the view that it is the Department of Conservation and Land Management's responsibility to manage the forest estate in accordance with objectives set through consultation and also to have a lead role in monitoring potential environmental impacts so that management may be modified in accordance with the results. However, in analogous manner to other proposals assessed by the EPA, the Authority has a responsibility to audit these environmental impacts. In the case of WACAP's proposal, most of the environmental conditions affect forest management rather than conversion of chiplogs into woodchips.

While the WACAP approvals relate to a period commencing in 1991, many aspects of the proposal are already operative. Where the Authority has identified concerns in relation to those activities, the Authority considers it inappropriate to wait until 1991 before applying them. As a consequence, the Authority believes that its recommendations in this Report should be implemented immediately. However, the Authority recognises that there are existing State approvals in place for the woodchip industry.

It is clear to the Authority that a proposal of the nature and scale of WACAP's requires periodic review during its approved operational period. This would permit issues related to resource, results of research and variations in operations to be brought together. Such reviews should be prepared as brief annual reports and a detailed and comprehensive report after five years, and should reflect the monitoring and management of the environmental impacts of the proposal. These reports should be presented to the Authority.

RECOMMENDATION 15

The Environmental Protection Authority, being of the view that implementation of this report would make it possible to improve environmental

protection of the South-Western Forests without adverse impacts on timber resources, recommends that its recommendations be implemented immediately rather than at the expiration of the current export licence.

RECOMMENDATION 16

The Environmental Protection Authority recommends that the WA Chip and Pulp Co Pty Ltd and the Department of Conservation and Land Management report to the Environment Protection Authority briefly annually and comprehensively after five years on the monitoring and management of the environmental impacts of the proposal.

8. CONFLICT RESOLUTION

Many issues were raised by the public reflecting conflict over forest use. Some conservationists differ with forest management over their techniques of forest use. There are also other conservationists who believe that forest should not be seen from a purely utilitarian view but that it has intrinsic value irrespective of any human needs. The Authority accepts that this philosophical difference underlies much of the conflict over forest issues.

Despite deep-seated differences there are also common objectives between conservationists and forest managers, eg:

- better utilization of the timber resource;
- production of value-added products, especially wood crafts;
- chipping of sawmill residues instead of burning them;
- establishment of plantations on cleared land; and
- production on a sustained use basis.

Common pursuit of these objectives has the potential to minimise environmental impacts whilst allowing productive use of the forest. Widespread continuing consultation to allow such objectives to be reached would seem to the Authority to be essential rather than the alternative of an inquiry as pressed for in some submissions. The "Forests Accord" proposal from the Commonwealth also presupposes such ongoing consultation.

RECOMMENDATION 17

The Environmental Protection Authority, being of the view that the use of continuing consultative processes by all sections of the community is the most beneficial way to reduce conflict over forest issues, recommends that all concerned should explore ways of ensuring regular consultation in relation to the matters dealt with in this report.

9. CONCLUSIONS

The Environmental Protection Authority has therefore concluded that the State could supply resource to WACAP within levels specified in the Timber Strategy in accordance with the Authority's Recommendations in this Report and commitments by the proponent in the ERMP and supplementary information.

Specifically the Authority concludes that there is scope for WACAP to produce up to 750,000 tonnes of woodchips from resources in South-Western Australia. The limits to producing woodchips from old-growth forest outlined in the Timber Production Strategy are:

1980 - 1990, 583,000 cubic metres
1991 - 1995, 553,000 cubic metres
1996 - 1998, 442,000 cubic metres

The shortfall between woodchips derived from old growth forest and from the quantity sought by WACAP would be made good from thinnings from regrowth forest, or eucalyptus plantations on private properties.

The Authority further considers that, subject to the above, the conversion of timber resource into woodchips and their transportation and export are environmentally acceptable.

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11. GLOSSARY

Allowable Cut: the amount of forest produce that may be cut in a given period under some plan of management.

Clearing: the removal of vegetation from an area of land, more or less permanently.

Clearfelling: the felling and removal of all standing trees in a defined area, to achieve uniform even-aged regeneration.

Coupe: a discrete felling area.

Fell, to: the act of cutting down a standing tree or trees.

Group Selection: a silvicultural system in which trees are felled in small groups either to permit regeneration to develop or to release advanced growth.

Integrated Harvesting: the concurrent or closely linked harvesting of several log products for sale to one or more buyers.

Multiple Use: management of land to ensure that as wide a range of uses as possible are provided for, consistent with the designated priority use of the land. Not all uses will be compatible at any particular point in time.

Residue: offcuts and waste wood materials resulting from the breakdown of logs into sawn products.

Selection cutting: a silvicultural system in which trees are removed individually over the whole area (usually in the course of a felling cycle), to maintain the stand in an uneven-aged condition.

Silviculture: the art and science of establishment and tending of forest.

State Forest: Crown land vested in the Lands and Forest Commission for the purpose of multiple use. The major uses of State Forest are for water supplies, recreation, sustainable timber production and for wildlife conservation.

Sustained Yield: a method or plan of management that implies continuous production with the aim of achieving, at the earliest practicable time and at the highest possible level, an approximately balance between net growth and yield.

Thinning: a felling made in an immature stand for the purpose of improving the growth of trees that remain without permanently breaking the canopy.

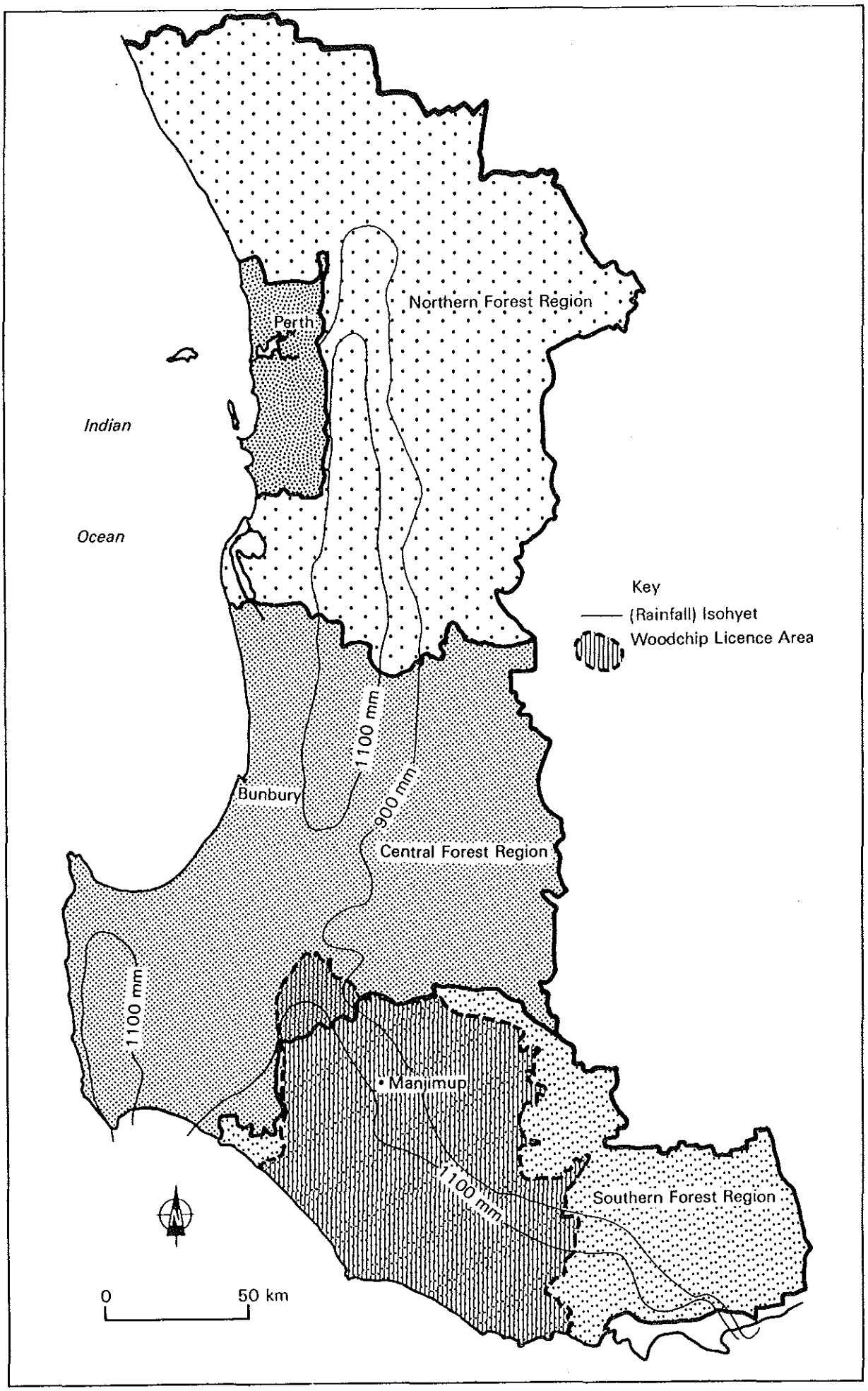


Figure 1. The Current Woodchip Licence Area

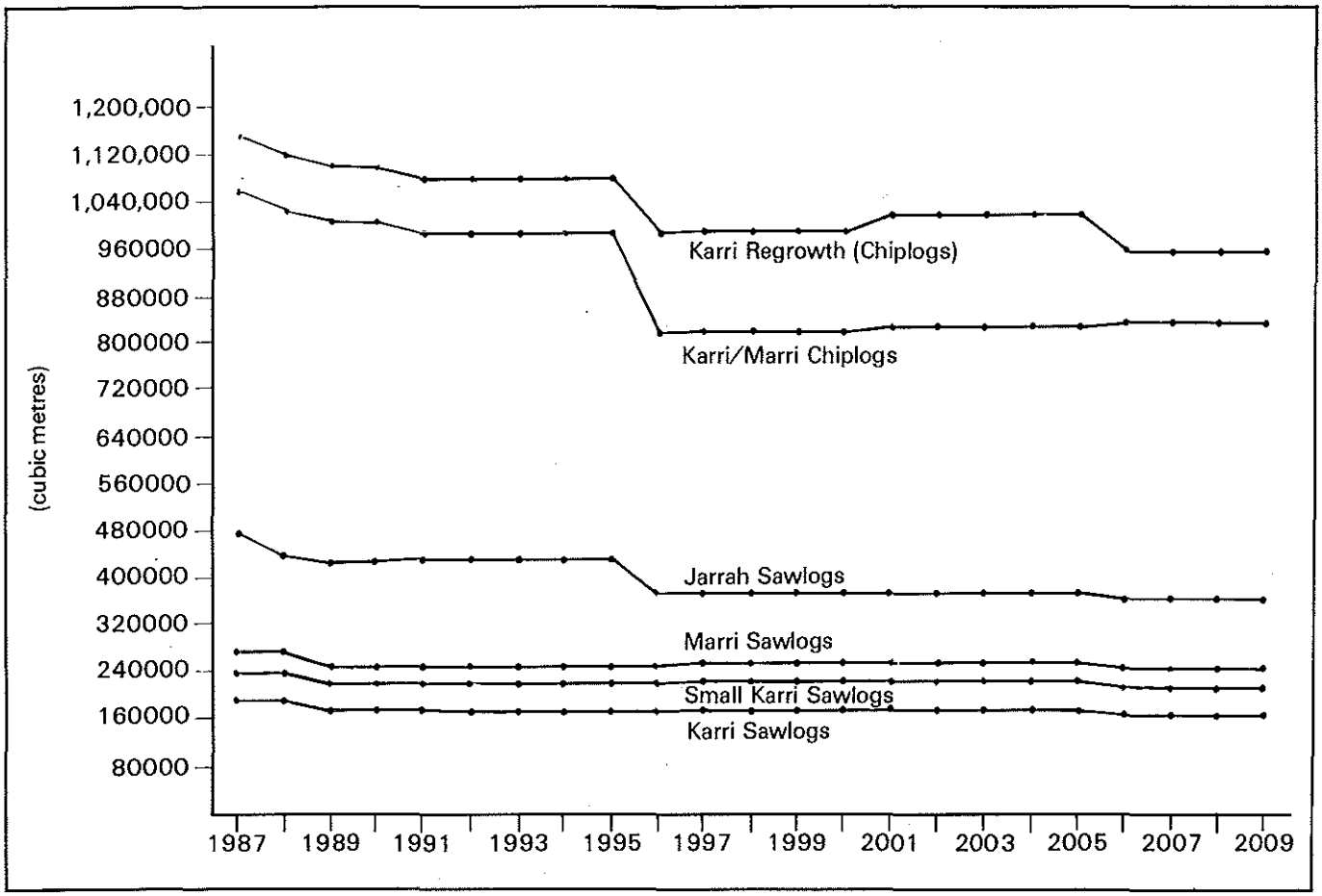
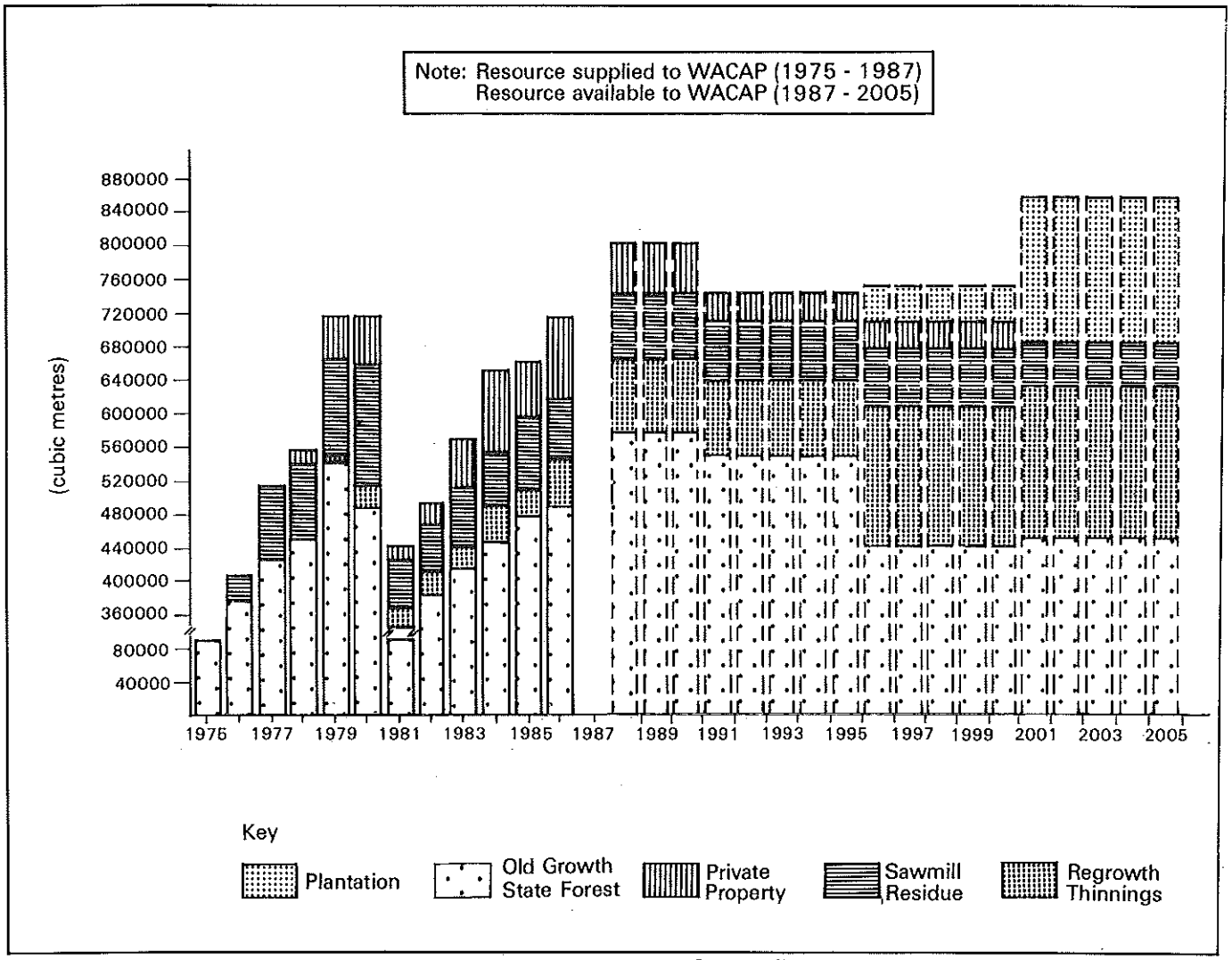


Figure 2. Projected Chiplog Sources from State Forest 1987-2009.



Source: Forests Department & CALM Annual Reports
CALM Timber Production Strategy
WACAP ERMP

Figure 3. WACAP's Sources of Chiplogs and Woodchips 1975-2005.

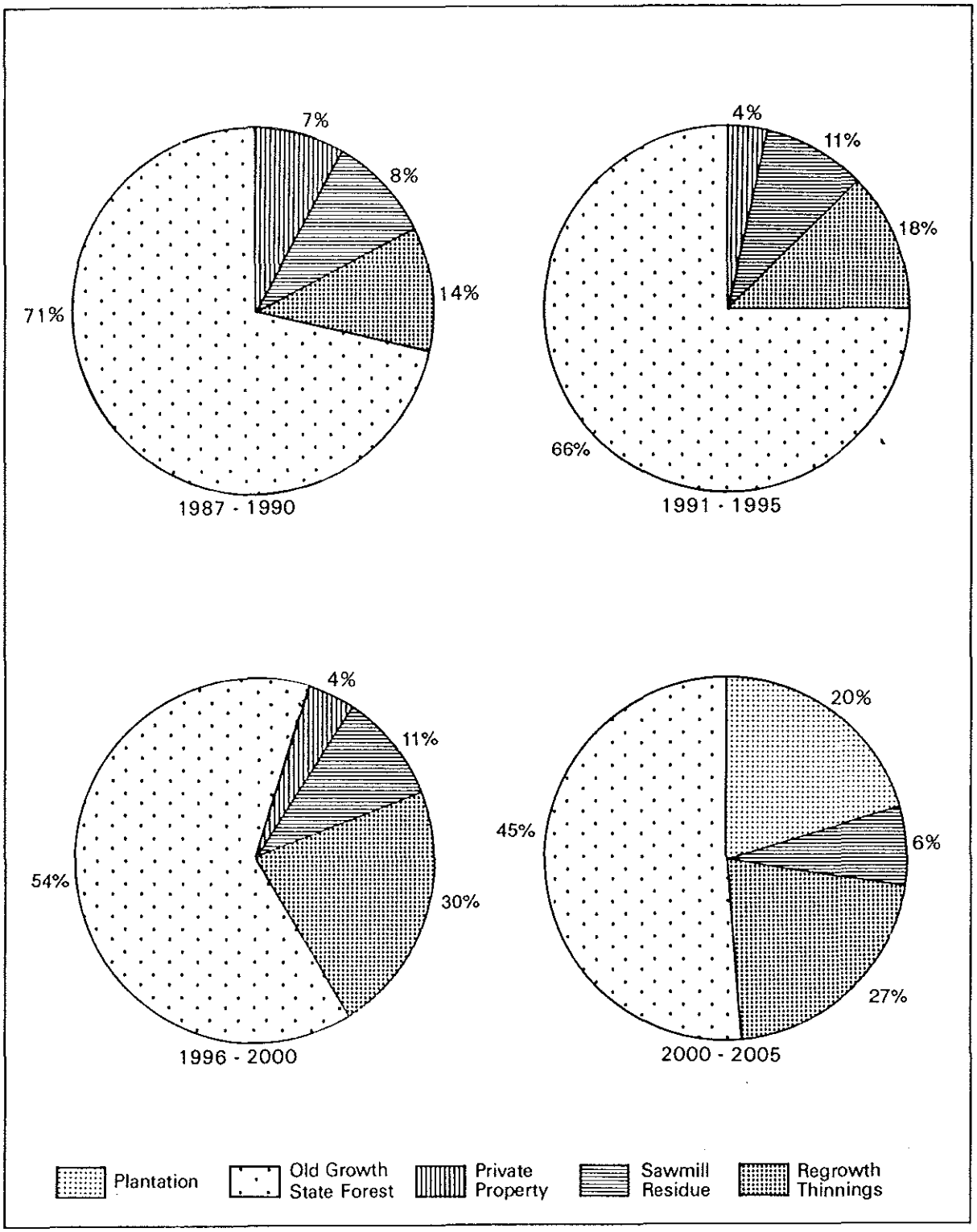
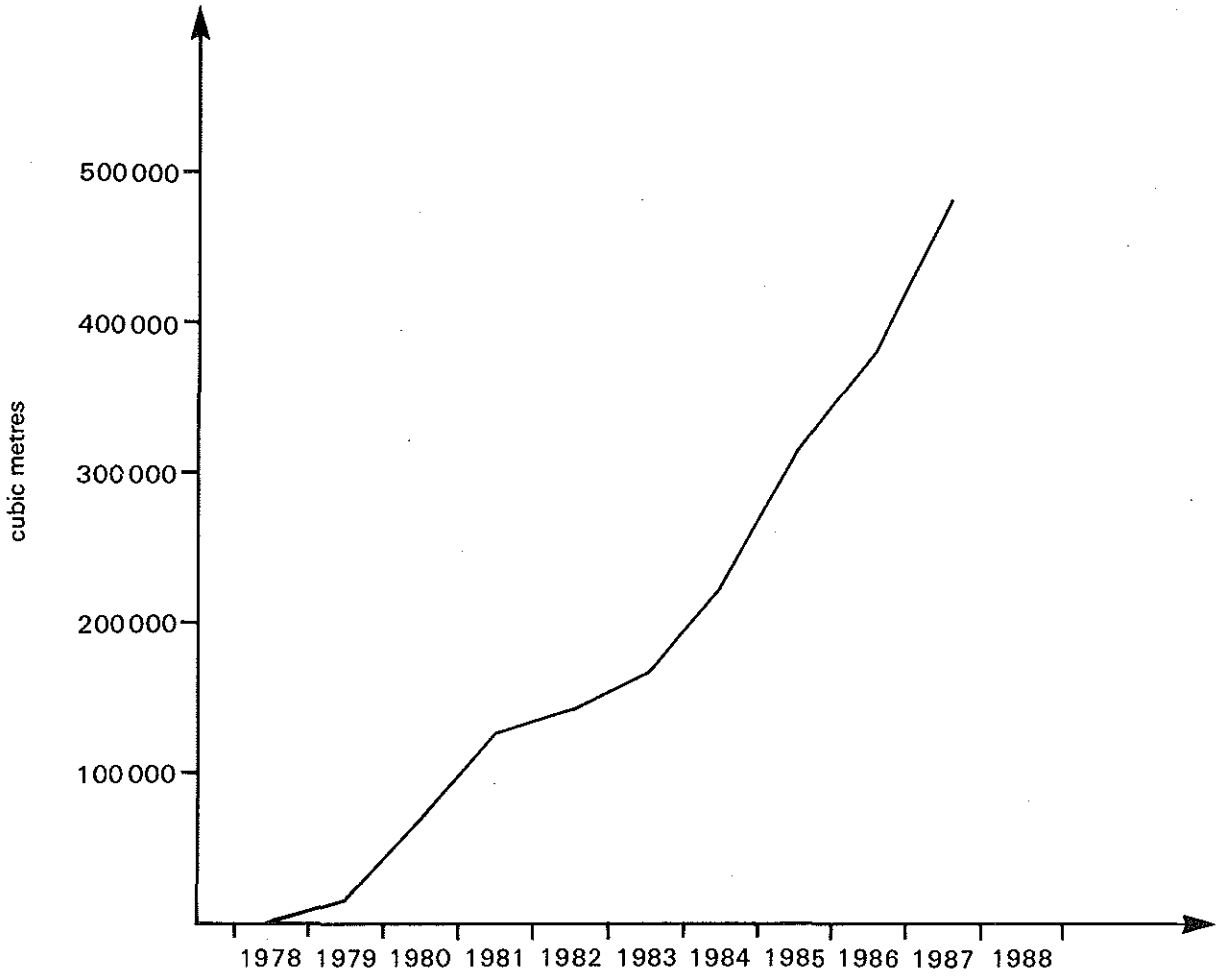


Figure 4. Proportions of Chiplogs and Woodchips Projected for WACAP 1987-2005.



(Source: Forests Department/CALM Annual Reports)

Figure 5. Cumulative Total of Resources obtained by WACAP from Clearing of Remnant Native Vegetation on Private Property.

APPENDIX 1

Summary of Issues Raised in Submissions in the ERMP

SUMMARY OF PUBLIC SUBMISSIONS

A total of 4372 submissions were received by the Environmental Protection Authority including 4258 proforma letters and 114 individual submissions, the latter including 8 from State and Local Government agencies, and 106 from members of the public and private organisations.

INDIVIDUAL SUBMISSIONS

Issues raised and suggested recommendations in individual submissions included:

Forest Operations - Ecological Impact

- Clearfelling of karri forest and virtual clearfelling of jarrah/marri forest combined with frequent regular prescribed burning of all our forests are destroying our native forests as we know them.
- Annual area extent of clearfelling is not given in the ERMP.
- Not enough is known about the ecology of our forests. Very little research has been done to find out what effects logging and burning are having on native fauna and flora.
- We are turning our native forest into short-rotation, fast-growing, even-aged tree plantations. The complex diversity of inter-relationships that comprises an ecosystem can never be even vaguely approximated by even-aged single species plantations.
- Virgin karri and jarrah forest should be excluded from logging and reserved for conservation purposes.
- Inadequate research has been done to show that the present woodchipping operations will not permanently damage the ecosystem.
- No discussion of any ecological problems with establishing non-indigenous plantations of eucalypts.
- Destruction of indigenous flora and impact on native fauna as a result of clearing of forest.
- Clearfelling causes erosion and loss of soil nutrients.
- Clearfelling threatens genetic diversity of flora.
- Loss of rare, endemic and endangered species of flora and fauna.
- Soil quality problems, including salinisation, erosion, compaction and leaching.
- Impacts on water quality including salinity, turbidity and eutrophication.
- Effects of burning on conservation values of forest.
- Woodchipping has entrenched environmentally unacceptable clearfelling and burning practices.

Sustainable Yield

. There appears to be considerable doubt whether utilisation of the State's forests are being managed on a sustainable basis.

. The term "sustainable yield" should be investigated. As the derivation of of its value has so many variables, a generous safety factor should be incorporated as a guard against overcutting.

. True sustainable yield is where all species and age classes are considered.

. reduce rate of logging so that no more mature wood is removed in one year than the forests produce.

. The crucial factor qualifying sustained productivity is the maintenance of an ecosystem's nutrient stocks and long term nutrient availability. The information contained in the ERMP and other available information on this topic present evidence for serious concern.

Forest Protection Measures

. Statements regarding protection measures are very vague, uncertain and open to interpretation.

. The treatment of safeguards and protective measures is inadequate; specific values intended to be protected are not identified, and it is thus impossible to assess the effectiveness of the measures described.

. Management of operations to minimise environmental impacts is still inadequate.

. The current (or proposed) clearing buffer guidelines of CALM could be used on private land, especially where the Soil and Land Conservation Act applies.
. Will the proponents actually perform as they say they will?

. Review the environmental prescriptions governing industry operations in State forests with a view to ensuring that a more environmentally sound and enforceable code of industry conduct is developed and implemented.

. To ensure WACAP has carried out operations in accordance with its ERMP, a review should take place after five years into the new licence period.

. Need regular public environmental reviews of the timber industry's operations in all forest areas.

Private Land Operations

. The Draft ERMP indicates that woodchipping has contributed to the permanent loss of 8000 ha of native forest on private land over the past decade.

. There is a total absence in the ERMP of any info about vegetation, flora or fauna, rare and endangered species in any of the private forest remnants from which the woodchip resource would come, nor was any commitment to undertaking surveys made in the ERMP.

. Use of the timber resource from private property for woodchipping is contrary to recommendations 5, 6, 7 and 8 of the Land Resource Policy Council's "Conservation of Native Vegetation In Farming Areas" report.

. The ERMP does not appear to acknowledge any of the problems, real or potential, of establishing plantations of non-indigenous eucalypts.

. Continuation of the proposal will exacerbate the loss of native forests on private land whose conservation values are currently not known.

. The EPA should require establishment of a proper and enforceable management system governing WACAP's operations on private land.

. No export licence should be granted for that part of WACAP's operations that would involve the clearing of native forest on private land.

. Felling of native forest on private land should be subject to a brief environmental report for any area of land proposed for clearing. Native forest of significant ecological/environmental importance should not be logged or woodchipped.

. Any private land felled for woodchips should be reafforested with indigenous trees.

. The ERMP indicates that WACAP intend to establish 10 000 ha of plantations at about 600 ha/yr over the next 15 years. This proposal, when considered in conjunction with CALM's plans to 30 000 ha at 500 ha/yr over the next 30 years raises two concerns:

  - reafforestation of cleared land could reduce stream flows for horticulture;

  - the reduction of area available for horticulture if a significant area of the 10 000 ha of WACAP or 15 000 ha of CALM plantations of valuable horticultural cleared land.

. Some reasonable limitations should be placed on the Company's purchase of agricultural land for the purpose of tree plantations.

. Urgent Government efforts are needed to protect the remaining natural forests on private land.

. Real incentives are required (eg an annuity) to encourage landowners to establish plantations on already cleared land.

. The very serious environmental and social impacts that were clearly identified as being associated with the McLean Forest Project would be directly associated with WACAP's private land operations.

Deficiencies in the ERMP

. The existing ERMP does not present an adequate picture of the WACAP renewal and its impacts, nor of the alternatives to the renewal.

. In sufficient information is available or is provided by the proponent to describe the environment to a degree which allows an adequate assessment either of the potential impacts or of their significance.

. The ERMP makes various errors and omissions and these faults should be corrected before the proposal is given any further consideration.

. Most CALM forest research is recent with no valid trends applicable to forest management in an ecological time scale. Wooodchip Resource.

. An annual chip log intake guaranteed in advance for a very long period is not desirable, and, therefore, it is dangerous to make a long term commitment to supply a high fixed annual tonnage of woodchips.

. Far from being a "waste" based industry, there is proof that large volumes of good timber have been woodchipped every year since the industry commenced.

. There is unnecessary waste of forest resources both left on the block and due to diversion of saw log into chip.

. Agricultural clearing and clearing for pine afforestation schemes have provided 6% of WACAP's woodchip tonnage over the past 11 years. WACAP "Forests" have provided only 1.7% of the tonnage over the past 7 years. That is, private clearing is of considerable importance to WACAP. This resource is is expected to continue to decline.

. WACAP specifications for chip logs include many logs with suitable sawn timber within.

. Reform current CALM log allocation to allow for redirection of all mature marri logs away from woodchips into milling for timber production.

. CALM's estimates of the woodchipping resource is not based on WA's sawn timber needs but on false projections that will result in increasing volumes of sawn timber being exported overseas and interstate.

. There should be only three sources of timber for woodchipping:

- logs from legitimate clearing operations from private property, road and other infrastructure construction;
- logs removed from the forest under normal CALM controlled timber harvesting operations, or for husbanding and improvement of the forest;
- logs from plantations grown specifically for the purpose.

Regional Perspectives

. There is a need for a strategic, regional perspective to impact assessment, stressing the complexity of ecological interactions and the difficulties this poses.

. Planning for management which would inevitably result in major impacts on a region, should be be broadly based; not restricted to a single Department and under no circumstances dominated by single discipline.

Conservation areas/reserves

. The Shannon Basin National Park is the cornerstone of an adequate system of secure, viable conservation reserves. Until it has been secured as a national park, there should be no consideration of the ERMP.

- Virgin and old growth forest should be reserved as national parks or nature reserves.

- The ERMP does not make it clear that current practice leaves approximately two in every three first and second order streams or water courses without any vegetation buffer.

- Road, River and Stream Zones should not be logged and logging should cease now and the system should be expanded to include lower order streams and all streams, ponds and soaks in clearfell areas.

- The level of current biological knowledge is insufficient to assess the degree to which the proposed reserve system is adequate with regard to conserving representatives of all major ecosystems in the region and conserving genetic diversity.

- There is inadequate description of the proposal to allow assessment local impacts on the specific heritage values of National Estate places.

- No account is taken of National Estate places outside the Licence Area.

- The ERMP fails to recognise that the National Estate encompasses much more than simply those places listed on the Register, which in itself is far from complete.

- No forestry practices are to be implemented in any place within the chip supply area which is registered on the National Estate, where those practices are incompatible with the National Estate values of the place.

- National Estate values in particular need to be more closely considered before the licence is extended.

- The ERMP addresses National Estate areas only, and does not consider sites, areas or trees which may be classified at the State level (ie by the National Trust).

Dieback Infection

- Increasing numbers of logs are being taken from disease risk areas (P. cinnamomi)

- The spread of dieback disease by logging and woodchipping operations is an extremely serious environmental threat to WA's jarrah forest.

- karri dieback fungus (Armillaria luteobubalina) is not mentioned in the ERMP, even though it has considerable potential to become a major threat to karri regrowth, especially if intensified forest management is introduced.

- There should be no expansion of integrated sawlog/woodchip operations into previously quarantined dieback risk areas and in jarrah/marri forest outside the licence area until a full impact assessment has been made.

Woodchip Licence

- The export licence quota should be reduced significantly.

. The export quota should be tied to current or average annual export level and/or sustained yield from forest.

Water Resource

. Concern is expressed that there be no increase in groundwater contribution to streams in the low rainfall area region. Therefore, in this region a coupe by coupe groundwater investigation is required to determine the appropriate size of stream buffers and/or the need for phased logging operations.

. The ERMP leave open the option to selectively thin river and stream reserves, consistent with their protection role. There is concern that buffers left for minimising groundwater discharge could be thinned leading to possible jeopardisation of the protection role of the buffer reserve.

Value Added Products

. WA hardwoods are a unique and limited resource and should be used for the highest value added product. Export native hardwood timbers as woodchips must be one of the lowest value products for these timbers.

. More effort needs to be made to process timber locally by the seasoning of hardwoods, establishing local furniture and plywood industries.

. A pulp industry should be established.

Alternative Industries

. The woodchip industry is destructive of employment potential for small scale milling operations which could effectively utilise many of he marri and karri logs going into the chipper.

. The current export woodchip industry damages job opportunities in the bee-keeping, sawmilling, recreation and tourist industries.

. Incentives should be given to small efficient labour intensive sawmillers to provide better recovery of timber from each log and access to logs that might otherwise be chipped.

. Selective removal of marri trees from forests will deleteriously effect the apiary industry.

. Tourism's significant impact on the Pemberton/Manjimup economy is not presented in the ERMP. The abundant available data which supports this view has not been used in the ERMP.

. The rather negative outlook in the ERMP on tourism in the Lower South West region is not justified. The important point to remember is that the growth rate in tourism is significantly higher than the timber industry in the Lower South West.

. Encouragement should be given to recycle paper.

. Other sources of materials for making paper should be sought.

Support for Licence Renewal

. There is widespread community support for the paperwood industry in Manjimup.

. The economic and employment contribution of the woodchip industry is considerable.

. The industry, integrated with sawlog harvesting has proven good silvicultural practice. Woodchipping utilises the waste from clearfelling operations, saw milling residues and clearing of agricultural land.

. Woodchipping and sawlog operations are essential to each other and the statement provides for their integration and continued operation.

. The proposal appears to be environmentally sound. From the professional research details available there appears to be no serious long term deleterious environmental effects caused by the woodchipping operations.

Other Issues and Recommendations

. There should be a one year moratorium on the proposal by WACAP to renew their woodchip export licence.

. Clearfelling causes dramatic changes to landscape attractions and wilderness quality of forest.

. Application for renewal of the export licence should be permitted at reduced rate with the view of a gradual reduction to mill residue only.

. There should be a through public inquiry into the way the forests are being managed and of the woodchip/timber industry.

. WA should be planning to meet the needs of the WA community for timber. Given the limited forests in WA, there should not be any planning for export, other than genuine waste. Encouragement should be given to the community to use alternative materials, eg steel in some constructions.

. Native forests should have no permanent allocation to the timber industry until assessed for its biological, recreational and heritage values.

. No information is provided on proposal details, environmental resources or likely impacts outside the Licence Area, despite the fact that 18-21% of the proposal's chip resources will come from such areas.

PROFORMA LETTERS

The proforma letters received by the Authority were as follows.

(i) Approximately 1650 copies received:

" I support:

. greater EPA efforts to WA's unique forest heritage;
. an inquiry into WA's woodchip/timber industries and forest management;

. restructuring of WA's export woodchip industry so that it uses only sawmill residues and resources from plantations established on already cleared land;
. there should be no permanent allocation of native forest to wood production until it has been assessed for its biological, recreational and heritage values."

(ii) 20 copies received:

"I oppose the renewal proposal for the WA woodchip industry in its present form. I support:

. the restructuring of the woodchip industry so that it uses only sawmill waste and logs from private plantations on already cleared land;
. logging of State forests only to supply WA's properly assessed needs;
. a substantially reduced woodchip renewal period and chipwood quota;
. full investigation of alternative uses for the chipwood resource."

(iii) Approximately 2600 copies received:

" I urge the continuance of this industry which:

. earned over $38 million in export dollars for Australia alone;
. brings more than 500 steady jobs to Australia's South West;
. helps re-grow new Karri forest to replace all harvested trees;
. works under strict Government controls to minimise environmental effects;
. uses low-grade wood unsuitable for sawmilling, which must be harvested to ensure good Karri re-growth, and would otherwise be burnt as waste.

I also urge that:

. new forests always continue to be re-grown after harvest;
. timber harvesting continues to be monitored to minimise environmental effects;
. Australia's economic need for wood products (including paper), jobs and export dollars, continues to be given due priority."

LIST OF PEOPLE AND ORGANISATIONS WHICH MADE SUBMISSIONS ON THE ERMP

ALDRIDGE C D
NANNUP

ANDERSON R & J
YALLINGUP

ANDRADE M
HILTON

AUSTRALIAN HERITAGE COMMISSION
CANBERRA

BARBER P M
ATTADALE

BARTROP R
NANNUP

W.A FARMERS FEDERATION
(BEEKEEPERS SECTION)
PERTH

BERRY C
CRAIGIE

BUTLER G
MT LAWLEY

CARLIA J
CLAREMONT

CHANDLER R
FREMANTLE

CHAPMAN L
CHIDLOW

CHAPPELLE C
DENMARK

CHIDGEY P
LESMURDIE

CHURCHWARD B
FLOREAT PARK

CLARK K
DENMARK

COALITION FOR DENMARK'S
ENVIRONMENT
DENMARK

COLLINSON G
WEMBLEY

COWNIE J & FRIENDS
CAPEL

CROSS D
CITY BEACH

DARBYSHIRE J
NEERABUP

DEPT OF PRIMARY INDUSTRY
CANBERRA

DEPT OF TRANSPORT
PERTH

DONCASTER A
COWARAMUP

DUNCUM S
BALINGUP

EWING P
COTTESLOE

FENBURY H & FRIENDS
SUBIACO

FLOOD R
EAST FREMANTLE

FOREST PRODUCTS ASSOCIATION
WEST PERTH

FORESTS FIRST
BRIDGETOWN

FUNCK A
DENMARK

GREAT SOUTHERN WILDERNESS EXPEDITIONS
DENMARK

HALL R
MT LAWLEY

HANDCOCK B
BUNBURY

HANSON M
DENMARK

HARMAN A
DENMARK

HARRIES M
SUBIACO

HARWOOD D
DENMARK

HAWKE J
SOUTH FREMANTLE

HAWKEN K & P
MARGARET RIVER

HAY M C
DALKEITH

HILL A
PEPPERMINT GROVE

HILLER J M
NEDLANDS

HOOK N
DENMARK

HOOK P
DENMARK

HUMPHRIES R
GRAYLANDS

HUNTER R C
MANJIMUP

IRVING C J
EAST FREMANTLE

JAMES C G
CRAWLEY

JOHNSTON P
PALMYRA

KEYNES L & A & FRIENDS
CLOVERDALE

LADWIG B
DENMARK

LALOR A
DENMARK

LANTZKE I R
PERTH

LINDSEY C P
ALBANY

LODGE K & R
DENMARK

MAIRATA A
SOUTH PERTH

MAWSON G B
ESPERANCE

MEN OF THE TREES
LESMURDIE

MERRILEES D
MANJIMUP

MIDDLESEX MILL
(DRAKE A F & M)
MANJIMUP

MILNE K
WALPOLE

MONIER ROOFING
BELMONT

NEVILLE S & DUXBURY L
DENMARK

NORDON M
STRATHFIELD SOUTH NSW

NOWAK R
WITCHCLIFFE

OLIVER D
DENMARK

OSEC COALITION FOR SENSIBLE
ENVIRONMENT CONSERVATION
MANJIMUP

PALMER S R
BUSSLETON

PEARCE J
WALPOLE

PERTH BUSHWALKERS CLUB
PERTH

RANKIN D
MARGARET RIVER

RANZETTA P & G
CITY BEACH

REDAPPLE S
ARDROSS

RICHTER M
EAST FREMANTLE

RINEY T
DENMARK

SADDLETON D S
DONNYBROOK

SAMMUT V
LEEDERVILLE

SCHUR B
COTTESLOE

SHEILS B H
MT HAWTHORN

SHIRE OF BRIDGETOWN/GREENBUSHES
BRIDGETOWN

SHIRE OF MANJIMUP
MANJIMUP

SHULTZ B
NEDLANDS

SHULTZ R
NEDLANDS

SINCLAIR H
SOUTH PERTH

SOUTH WEST ALTERNATIVE NETWORK
BRIDGETOWN

SOUTH WEST FOREST DEFENCE
FOUNDATION
PERTH

SPURGE K C & J H
COOLUP

STANLEY R
NANNUP

STANTON J
SHENTON PARK

STATE PLANNING COMMISSION
PERTH

STRETCH W N (MLC)
WAGIN

STURCKE M
MORLEY

SUNDSTROM P
NORNALUP

SWITZER C
EAST FREMANTLE

THE INST OF FORESTERS OF AUST (WA)
PERTH

THE NATIONAL TRUST OF AUSTRALIA (WA)
WEST PERTH

MACDONALD B
ORELIA

THE WILDERNESS SOCIETY
PERTH

THOMSON J A
SOUTH PERTH

TIME FOR CHANGE-JOINT SUBMISSION
BY AUST CONSERVATION FOUNDATION/
CAMPAIGN TO SAVE NATIVE FORESTS/
CONSERVATION COUNCIL OF WA (INC)
PERTH

TOWNLEY J
DENMARK

VAN HOOFT F
ALBANY

WALLENT E
MANJIMUP

WATER AUTHORITY OF WA
PERTH

WEST AUST WILDFLOWER SOCIETY
NEDLANDS

DEPT OF AGRICULTURE
PERTH

TOURISM COMMISSION
PERTH

WHITTAKERS LTD
WELSHPOOL

WILLIAMS P C & LA BROOY S R
LEEMING

WYLIE A
TRIGG

ZLATNIK D
DARLINGTON

THE TREE SOCIETY
MT LAWLEY

MEN OF THE TREES
LESMURDIE

MERRILEES D
MANJIMUP

MIDDLESEX MILL
(DRAKE A F & M)
MANJIMUP

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DONNYBROOK

SUMMARY OF SUBMISSIONS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
DISCREPANCIES/ERRORS/ OMISSIONS PRESENTED IN ERMP																														x																				
VISUAL IMPACT OF CLEARFELLING																														x																				
ROAD, RIVER AND STREAM RESERVES NOT TO BE LOGGED																																																		
EXPAND ROAD, RIVER AND STREAM RESERVE SYSTEM																														x																				
BUFFERS ON ALL STREAMS IN CLEARFALL AREAS																													x	x																				
WATER QUALITY IMPACTS																														x																				
INADEQUATE AREAS OF FOREST SET ASIDE FOR CONSERVATION																																												x						
SOIL QUALITY AND EROSION IMPACTS																																x																		
NUTRIENT BALANCE PROBLEMS																																																		
NO LOGGING IN FORMER DIEBACK QUARANTINE AREAS UNTIL MORE RESEARCH DONE																																																		
LOGGING OF STATE FOREST ONLY TO SUPPLY WA'S NEEDS																																									x	x	x	x		x				x	
INVESTIGATE ALTERNATIVE USES FOR WOODCHIPS																																									x	x	x	x		x				x	
ENCOURAGE VALUE-ADDED PRODUCTS																		x												x			x																	
MAXIMISE SAWLOGS RECOVERY																													x	x																				
SUPPORT FOR CONTINUATION OF WACAP'S OPERATIONS FOR THE EXPORT LICENCE RENEWAL																															x																		
DECREASE WOODCHIP QUOTA/ RENEWAL PERIOD																																								x	x	x	x		x				x	
REDUCE AMOUNT OF WOODCHIPPING		x			x													x												x					x														
EXPAND FOREST AREAS		x																																																
AGAINST MORE WOOD-CHIPPING AND LOGGING				x													x			x																														
PROTECT FOREST LANDSCAPE				x												x																																		
DONT CHIP MATURE KARRI																													x																					

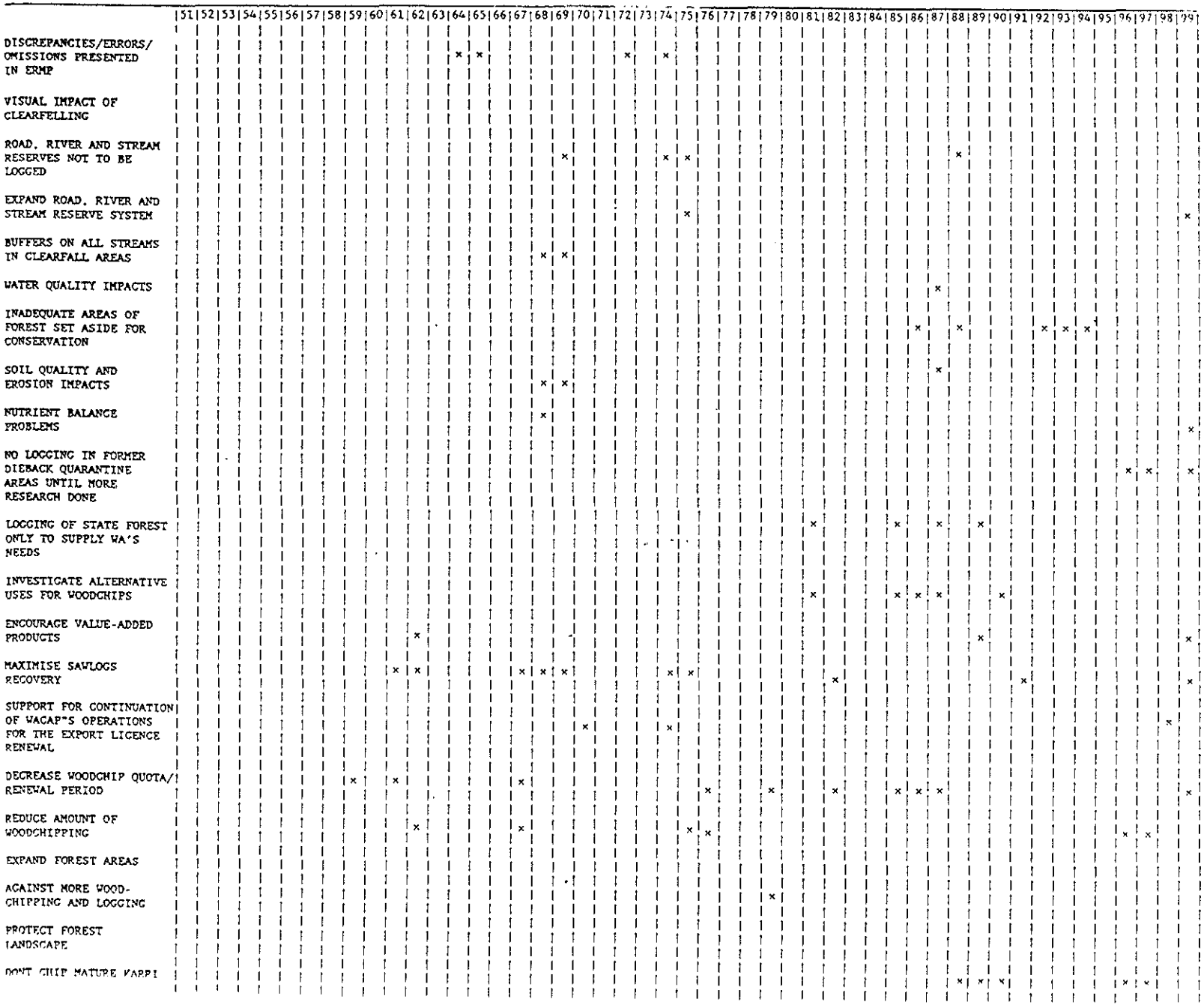
SUMMARY OF SUBMISSIONS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
LOSS OF GENETIC DIVERSITY																														x																			
MANAGEMENT PRESCRIPTIONS NOT COMPLIED WITH																																																	
DIEBACK SPREAD BY LOGGING OPERATIONS																																																	
FLORA/FAUNA IMPACTS OF CLEARFELLING/LOGGING																																																	
IMPLICATIONS FOR FOREST DISEASES AND PESTS																																																
EFFECTS OF FIRE																														x		x		x															
BETTER PUBLIC EDUCATION ON FOREST MANAGEMENT																														x																		
IMPACT ON NATIONAL ESTATE & VALUES																												x		x																		
WA'S EXPORT WOODCHIP INDUSTRY SHOULD USE ONLY SAWMILL RESIDUES FROM PLANTATIONS ON CLEARED LAND					x	x	x	x	x	x	x	x	x	x					x	x	x	x	x	x	x	x	x	x				x			x	x	x		x	x	x	x		x	x	x		x
NO PERMANENT ALLOCATION OF NATIVE FOREST TO WOOD PRODUCTION UNTIL ASSESSED FOR BIOLOGICAL, RECREATIONAL AND HERITAGE VALUES						x	x	x	x	x	x	x	x	x					x	x	x	x	x	x		x	x	x					x			x	x		x	x				x	x			
RECYCLE PAPER																																	x																
INADEQUATE RESEARCH INTO FOREST ECOLOGY																																																
ECOLOGICAL DAMAGE OF INTENSIVE FORESTRY PRACTICES																																																
WOODCHIPPING ONLY OF FIELD AND/OR SAWMILL WASTE AND PLANTATIONS	x		x	x	x																							x				x															
ENCOURAGEMENT FOR WASTE FROM LOGGING TO BE UTILISED															x														x							x												
REPLACING MIXED FORESTS WITH EVEN-AGED FOREST ECOLOGICALLY UNSOUND																												x			x	x	x														
ECOLOGICAL DAMAGE OF CLEARFELLING																												x	x		x	x	x													x	
MORATORIUM ON WACAP EXPORT LICENCE RENEWAL																												x																	x	x	

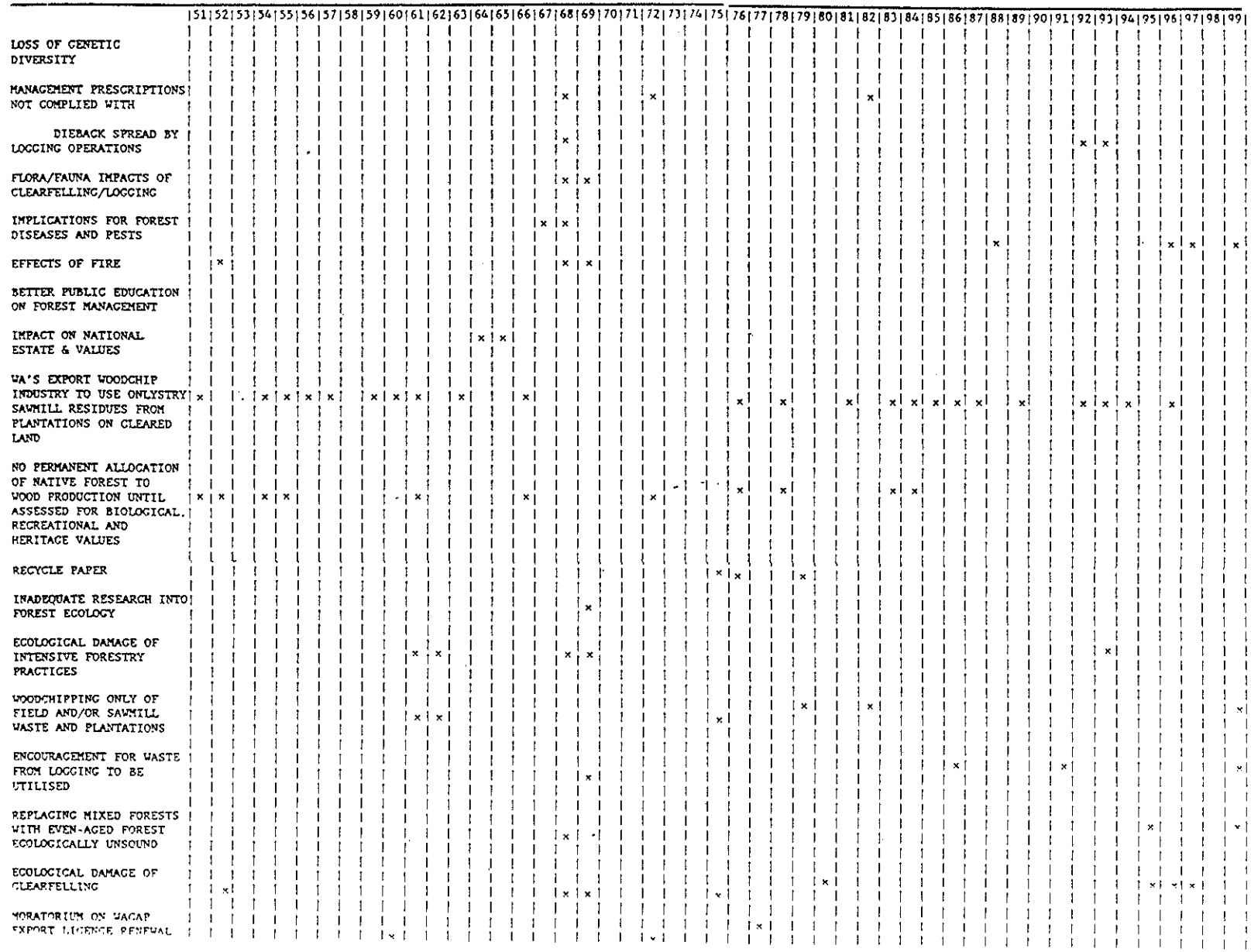
SUMMARY OF SUBMISSIONS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
SUPPORT TREE PLANTATIONS ON CLEARED LAND																		x												x			x	x																
IMPACTS ON TOURISM																																x			x															
IMPACTS ON SPOTMILLERS & OTHER SAWMILLERS																																x			x															
IMPACTS ON APIARY INDUSTRY																																x			x															
IMPACTS ON RECREATIONAL VALUES OF FORESTS																																																		
PROTECT REMAINING FOREST ON PRIVATE PROPERTY					x	x																																												
GREATER EPA EFFORTS TO PROTECT WA'S UNIQUE NATIVE FOREST HERITAGE						x	x	x	x	x	x	x	x	x					x	x	x	x	x	x	x	x	x	x								x	x		x	x					x	x			
CONDUCT AN INQUIRY INTO WA'S WOODCHIP/ TIMBER INDUSTRIES AND FOREST MANAGEMENT				x	x	x	x	x	x	x	x	x	x	x					x	x	x	x	x	x	x	x	x	x					x			x	x	x	x	x	x					x	x			x
SUPPORT JOINT SUBMISSION ISSUES																																																		

SUMMARY OF SUBMISSIONS



SUMMARY OF SUBMISSIONS



SUMMARY OF SUBMISSIONS

	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
SUPPORT TREE PLANTATIONS ON CLEARED LAND									x																																						x
IMPACTS ON TOURISM								x																													x			x	x		x		x		
IMPACTS ON SPOTMILLERS & OTHER SAWMILLERS																					x																						x		x			
IMPACTS ON APIARY INDUSTRY			x														x																											x		x		
IMPACTS ON RECREATIONAL VALUES OF FORESTS																																																
PROTECT REMAINING FOREST ON PRIVATE PROPERTY									x		x																																					
GREATER EPA EFFORTS TO PROTECT WA'S UNIQUE NATIVE FOREST HERITAGE	x		x		x											x	x											x						x		x											
CONDUCT AN INQUIRY INTO WA'S WOODCHIP/TIMBER INDUSTRIES AND FOREST MANAGEMENT			x		x						x	x		x		x			x								x						x		x			x			x					x
SUPPORT JOINT SUBMISSION ISSUES										x			x									x																									

SUMMARY OF SUBMISSIONS

	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114
DISCREPANCIES/ERRORS/ OMISSIONS PRESENTED IN ERMP					×		×	×							
VISUAL IMPACT OF CLEARFELLING					×										
ROAD, RIVER AND STREAM RESERVES NOT TO BE LOGGED															
EXPAND ROAD, RIVER AND STREAM RESERVE SYSTEM															
BUFFERS ON ALL STREAMS IN CLEARFALL AREAS															
WATER QUALITY IMPACTS		×											×		
INADEQUATE AREAS OF FOREST SET ASIDE FOR CONSERVATION	×					×	×			×					
SOIL QUALITY AND EROSION IMPACTS								×							
NUTRIENT BALANCE PROBLEMS		×													
NO LOGGING IN FORMER DIEBACK QUARANTINE AREAS UNTIL MORE RESEARCH DONE															
LOGGING OF STATE FOREST ONLY TO SUPPLY WA'S NEEDS		×													
INVESTIGATE ALTERNATIVE USES FOR WOODCHIPS															
ENCOURAGE VALUE-ADDED PRODUCTS		×													
MAXIMISE SAWLOGS RECOVERY		×													
SUPPORT FOR CONTINUATION OF WACAP"S OPERATIONS FOR THE EXPORT LICENCE RENEWAL			×												
DECREASE WOODCHIP QUOTA/ RENEWAL PERIOD															
REDUCE AMOUNT OF WOODCHIPPING															
EXPAND FOREST AREAS															
AGAINST MORE WOOD-CHIPPING AND LOGGING															
PROTECT FOREST LANDSCAPE															
DONT CHIP MATURE KARRI	×	×													

SUMMARY OF SUBMISSIONS

	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114
LOSS OF GENETIC DIVERSITY		x													
MANAGEMENT PRESCRIPTIONS NOT COMPLIED WITH							x	x							
DIEBACK SPREAD BY LOGGING OPERATIONS							x	x		x				x	
FLORA/FAUNA IMPACTS OF CLEARFELLING/LOGGING		x						x							
IMPLICATIONS FOR FOREST DISEASES AND PESTS		x					x	x		x				x	
EFFECTS OF FIRE							x	x				x			
BETTER PUBLIC EDUCATION ON FOREST MANAGEMENT															
IMPACT ON NATIONAL ESTATE & VALUES								x							
WA'S EXPORT WOODCHIP INDUSTRY SHOULD USE ONLY SAWMILL RESIDUES FROM PLANTATIONS ON CLEARED LAND		x				x									
NO PERMANENT ALLOCATION OF NATIVE FOREST TO WOOD PRODUCTION UNTIL ASSESSED FOR BIOLOGICAL, RECREATIONAL AND HERITAGE VALUES								x							
RECYCLE PAPER		x				x									
INADEQUATE RESEARCH INTO FOREST ECOLOGY							x	x							
ECOLOGICAL DAMAGE OF INTENSIVE FORESTRY PRACTICES								x			x		x	x	x
WOODCHIPPING ONLY OF FIELD AND/OR SAWMILL WASTE AND PLANTATIONS	x														
ENCOURAGEMENT FOR WASTE FROM LOGGING TO BE UTILISED						x									
REPLACING MIXED FORESTS WITH EVEN-AGED FOREST ECOLOGICALLY UNSOUND	x							x							
ECOLOGICAL DAMAGE OF CLEARFELLING	x	x						x			x		x	x	x
MORATORIUM ON WACAP EXPORT LICENCE RENEWAL								x							

SUMMARY OF SUBMISSIONS

	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114
SUPPORT TREE PLANTATIONS ON CLEARED LAND															
IMPACTS ON TOURISM		x			x			x							
IMPACTS ON SPOTMILLERS & OTHER SAWMILLERS		x							x						
IMPACTS ON APIARY INDUSTRY		x						x							
IMPACTS ON RECREATIONAL VALUES OF FORESTS								x							
PROTECT REMAINING FOREST ON PRIVATE PROPERTY								x							
GREATER EPA EFFORTS TO PROTECT WA'S UNIQUE NATIVE FOREST HERITAGE															
CONDUCT AN INQUIRY INTO WA'S WOODCHIP/TIMBER INDUSTRIES AND FOREST MANAGEMENT						x	x								
SUPPORT JOINT SUBMISSION ISSUES															

APPENDIX 2

List of Publications on the Forests of South Western Australia

LIST OF PUBLICATIONS ON THE FORESTS OF SOUTH WESTERN AUSTRALIA

The following is a list of publications which contribute to the understanding and conservation of ecosystems of southern forests in the south west of Western Australia. The list is near complete where the ecosystems per se were under consideration. However, in recognition of the fact that many insights into the working of ecosystems come indirectly from work done on their commercial exploitation or even replacement, a selected list is included also from the fields of silviculture, hydrology, and pathology, (in particular dieback). As the literature from these latter fields is now extensive its inclusion in toto was considered to be unwarranted.

1. THE ENVIRONMENT - Physical and Biological

1.1 CLIMATE

1.1.1 Bureau of Meteorology (1962). Climate Survey. Region 12 - Albany, Western Australia.

1.1.2 Bureau of Meteorology (1965). Climate Survey. Region 16. South West of Western Australia.

1.2 GEOLOGY, PHYSIOGRAPHY, GEOMORPHOLOGY AND SOILS

1.2.1 Jutson, J T (1934). The Physiography of Western Australia. Bulletin Geological Survey Western Australia 95.

1.2.2. Hosking, J S & Burville, G H (1938). A Soil Survey of part of the Denmark Estate Western Australia. CSIRO Bulletin No 115.

1.2.3 Smith, R (1951). Pedogenesis in the Frankland River Valley. Western Australia. CSIRO Bulletin 262.

1.2.4 Hassell, C W (1962). Estuarine Sedimentation in Western Australia. PH D Thesis. University of Western Australia.

1.2.5 Lowry, D C (1962). Busselton and Augusta WA Geological Survey. 1:250 000 Geological Series Explanatory Notes.

1.2.6 McArthur, W M & Clifton, A L (1975). Forestry and Agriculture in relation to soils in the Pemberton area of Western Australia. CSIRO Soil and Land Use Series 54.

1.2.7 Northcote, K H, Bettenay, E, Churchward, A M & McArthur W M (1976). Atlas of Australian Soils. Explanatory data for sheet 5. Perth-Albany. Esperance area. CSIRO and Melbourne University Press.

1.2.8 Biggs, E R, Wilde, S A and Leach, R E J (1980). Geology, Mineral Resources and hydrogeology of the Darling System, Western Australia - In Atlas of National Resources. Darling System. Western Australia Department of Conservation and Environment.

1.2.9 Churchward, H M, Mc Arthur, W M (1980). "Landform and Soils of the Darling System in Western Australia" In Atlas of Natural Resources, Darling System Western Australia. Department of Conservation and Environment.

1.2.10 Beard, J S (1981). Vegetation Survey of Western Australia: Swan. 1:1 000 000. Vegetation series - Part 1 - see Section 3.

1.2.11 Wilde, S A & Walker I W (1982). 1:250 000 geological series. Explanatory Notes. Collie. Geological Survey, Western Australia.

1.2.12 Wilde, S A & Walker, I W (1984). 1:250 000 geological seriers. Explanatory Notes. Pemberton - Irwin Inlet. Geological Survey. Western Australia.

1.2.13 Muhling, P C, Brakel, A T & Moncrieff, J S (1985). 1:250 000 geological series - Explanatory Notes. Mount Barker - Albany. Geological Survey. Western Australia.

1.2.14 Churchward, H M, McArthur, W M, Sewell, P L & Bartle, G A (1986). Landform and Soils of the South Coast and Hinterland; Northcliffe to Many Peaks, Western Australia. CSIRO Aust Div Groundwater Resources Tech Paper (in press).

1.3 FLORA - Vegetation, Plant Ecology and Nutrition

1.3.1 Abbot, I, Van Heurch, P & Wang L (1984). Repsonses to long term fire exclusion: Physical, chemical, and faunal features of litter and soil in a Western Australian Forest. Aust. For. Vol 47. 237-242.

1.3.2 Grove, T S (in press). Growth responses of trees and industry to applied nitrogen and phosphorus in Karri (Eucalyptus diversicolor) forest. For. Ecol. Management. (in press)

1.3.3 Hingston, F J, Malaczuk, N & Grove. T S (1982)'Actylene reduction (N_2-fixation) by Jarrah forest legumes following fire and phosphate application.' J. App. Ecol. 19: 631-645.

1.3.4 Inions, G (in preparation). Classification of Sites in Karri Regeneration. II. Florestics. Department of Conservation and Land Management.

1.3.5 Loneragan, O W (1979) Karri (E diversicolor F. Muell). Phenological studies in relation to Reforestration - Bull 90 Forests Dept of Western Australia.

1.3.6 Strelein, G J (in preparation). Handbook for the identification of site type in Southern Jarrah forest. Dept of Conservation and Land Management.

1.3.7 Diels, L (1966). Die Pflanzenwalt von West Australiein sudlien Wendeskreises. In. Die Vegetation dex Ende (Engler A and Drude. O. Eds) W. Englemans. Leipzig.

1.3.8 Jutson J T (1934). The Pysiography of Western Australia. Bull-Gere Survey's W. Aust. 95 - see section 2 above.

1.3.9 Gardner, C A (1942). The Vegetation of Western Australia with special reference to climate and soil. J. Royal. Soc. W. Aust. 28. 11-87.

1.3.10 Holland, A A (1953). The Ecology of south western and southern Eveinean provinces with special reference to Eucalypt formations. M Sc Thesis University of West Aust.

1.3.11 McNamara, P J (1959). Air Photo Mapping of the Western Australian Eucalypt Forest. Proe. 1959 ANZAAS Congress Perth Section K. Agriculture.

1.3.12 Loneragan, O W (1961),'Jarrah E marginata Sm) and Karri (E. Diversicolor F. Muell) Regeneration in South Western Australia. MSc. Thesis. University of WA.

1.3.13 Loneragan, O W & Loneragan, J F, (1964).'Ashbea and Nutrients in the Growth of Seedlings of Karri (Euc. diversicolor FV.M) J. Royal. Soc. WA Vol 47.

1.3.14 Churchill, D M (1967). The Distribution and Prehistory of E diversicolor, E marginata and E calophylla in relation to rainfall. Journal of Botany 16. 125-151.

1.3.15 Smith, F G, (1972). Vegetation Survey of Western Australia. Pemberton S1 50-10. Irwin Inlet S1 50-10 Western Australia. Department of Agriculture.

1.3.16 Christensen P (1973). Some ecological aspects of Jarrah Dieback. Forest Focus No 10. 11-15. Forests Department of Western Australia.

1.3.17 Smith, F G (1973). Vegetation Survey of Western Australia Vegetation Map. Busselton S1 50-5. Augusta S1 50-9. Western Australia. Department of Agriculture.

1.3.18 Specht, R L, Roe, E M & Boughton, V H (1974). Conservation of major plant communities in Australia and Papua New Guinea. Aust J. Botany Supp. Sci. 7. 1-667.

1.3.19 Christensen, P E S & Kimber, P (1975). Effects of prescribed burning in flora and fauna of South Western Australia Forests. Proc. Ecol. Soc. Aust., 9, 85-107.

1.3.20 Hingston, F J (1977). Sources of and soils for, nutrients in forest ecosystems.' CSIRO. Division of Land Resources Management, Perth pp 41-55.

1.3.21 Hussey, B M (1977). Excursion Whicher Range - Donnybrook Sunklands. Western Australian Naturalist. 13, 8, 211-216.

1.3.22 Underwood, R J (1978). Natural fire periodicity in the Karri (Eucalyptus diversicolor F. Muell) forest. Research Paper 41. Forests Dept of Western Australia.

1.3.23 Carbon, B A, Bartle, G A & Murray, A M (1979). Leaf Area Index of some eucalypt forests in South Western Australia. Aust. For. Res. 9. 323-26.

1.3.24 Hingston, F J, Turton, A G & Dimmock, G M (1979). 'Nutrient Distribution in Karri (Eucalyptus diversicolor F. Muell) Ecosystems in southwest Western Australia.' Forest. Ecol. Management 2: 133-58.

1.3.25 Marchant, N & Keighery C (1979). Poorly collected and presumably rare vascular plants of Western Australia. Kings Park Research Notes. No 5. 1-103 Kings Park Board.

1.3.26 Beard, J S (1980). Vegetation Survey. SWAN 1:1 000 000. (see section 1.2)

1.3.27 Beard, J S (1980). A new Phytogeographic map of Western Australia. West Aust Herb Research Notes 3 Perth.

1.3.28 Bell, D T & Barry, S J (1980). Nitrogen economy in Jarrah forest catchments in R A Rummery and F J Hingston (eds). 'Managing nitrogen economies of natural and man made forest ecosystems.' CSIRO. Div of Land Resources Management Perth WA pp 28-46.

1.3.29 Grove, T S, O'Connell, A M & Malaczuk, N (1980). 'Effects of fire on the growth, nutrient cycling and rate of nitrogen fixation of the cycad Macrozamia reidlei'. Aust. J. Bot. 28:271-281.

1.3.30 Heddle, E M, Loneragan, O W & Havel, J (1980). Vegetation complexes of the Darling System Western Australia. In - Atlas of Natural Resources. Darling System. Western Australia. Dept of Conservation and Environment.

1.3.31 Heddle E M, Loneragan, O W & Havel, J J (1980). Vegetation complexes of the Darling System Western Australia; in 'Atlas of Natural Resources, Darling System, Western Australia' Dept of Conservation and Environment, Western Australia.

1.3.32 O'Connell, A M (1980) Nitrogen cycling in Karri (Eucalyptus diversicolor F. Muell) forest litter in R A Rummery and F J Hingston (eds). 'Managing Nitrogen Economics of Natural and Man Made Forest Ecosystem.' CSIRO Perth WA pp 259-264.

1.3.33 Hingston, F J, Dimmock, G M & Turtin, A G (1980/81).'Nutrient distribution in Jarrah (Eucalyptus marginata Donn ex Sm) ecosystems in south west Western Australia Forest. Ecol. Management 3. 183-207.

1.3.34 Christensen P, Recher, K & Hoare, J (1981). Response of open forest to fire regimes. In. A M Gill. R H Groves and R Noble. Fire and the Australian Biota. Australian Academy of Science. Canberra.

1.3.35 Muix, B G (1981). D'Entrecasteaux National Park resource study. National Parks Authority of Western Australia, Perth.

1.3.36 O'Connell, A M, Grove, T S, and Lamb, D (1981).'The Influence of fire on the nutrition of Australian forests.' Proceedings of the Australian Forest Nutrition Workshop. Canberra. CSIRO Melbourne pp 277-289.

1.3.37 Recher, H F & Christensen, P E S (1981). 'Fire and the Evolution of Australian biota, in A Keast and W Junk (eds) 'Biogeography and Ecology in Australia.' The Hague.

1.3.38 Rye, B L & Hopper, S D (1981). 'A guide to the gazetted rare flora of Western Australia.' Report No 42 Dept of Fisheries and Wildlife Western Australia.

1.3.39 O'Connell, A M & Menage, P M A (1982). 'Litter Fall and nutrient cycling in Karri (Eucalyptus diversicolor F. Muell) forest in relation to stand age. Aust. J. Ecol. 7 49-62.

1.3.40 Patrick, S J & Hopper, S D (1982). A Guide to the Gazetted Rare Flora of Western Australia. Supplement 1 Report No 54. Dept of Fisheries and Wildlife Western Australia.

1.3.41 Abbot, I & Loneragan, O (1983). Influences of fire on growth rate, mortality and butt damage in Mediterranean forest of Western Australia. Forest Ecology and Management. 6. 139-153.

1.3.42 Dell, B, Bartle J R & Tacey, W A (1983). Root occupation and root channels of jarrah forest.' Aust. J. Botany 31. 615-27

1.3.43 Griffin, E A & Associates (1984). Vegetation survey of three nature reserves in the Lake Unieup complex. Lake Unieup. Kulunilup Lake and Yarnup Lake. Prepared for Dept of Fisheries and Wildlife.

1.3.44 O'Connell, A M (1984). 'Nutrient accession to the forest in Karri (Eucalyptus diversicolor F. Muell) forests of varying age.' For Ecol. Manage. 9.

1.3.45 Grove, T S & Malaczuk, N (1985a) 'Nutrient accumulation by trees and understorey shrubs in an age-series of Eucalyptus diversicolor. F. Muell. For Biol. Management 11. 59-74.

1.3.46 Annels, A R (1986). Plant species list for the Shannon and D'Entrecasteaux National Parks In. Walker et al. Shannon Park and D'Entrecasteaux National Park. Draft Management Plan.

1.3.47 Grove, T S, O'Connell, A M & Dimmock, G M, (1986). 'Nutrient changes in surface soils after an intense fire in jarrah (Eucalyptus marginata Donn ex Sm) forest.' Aust. J. Ecol. 303-317.

1.3.48 Hansen, A P (1986). The significance of selected Western Australian shrub legumes to the nitrogen economy of the jarrah forest ecosystem. Unpublished. Ph D Thesis University of West. Aust.

1.3.49 O'Connell, A M (1987). 'Nutrient accumulation in and reelease from the litter layer of the karri (Eucalyptus diversicolor F Muell) forests of south Western Australia. J. Ecol. Manage. (in press).

1.4 FAUNA - Animal Ecology

1.4.1 Christensen, P (19) Focus on a new concept in forestry - Fauna Priority Aras. Forest Focus No 10 Forests Dept of Western Australia.

1.4.2 White, S R (1952). The occurrence of the Quokka in the south west Western Australian Naturalist. 3.5, 101-3.

1.4.3 Main, A R (1963). A new species of Crinia (Anura heptodactylidae) from National Park. Nornalup, Western Australian Naturalist. 8.6 143-144.

1.4.4 Churchill, D M & Christensen, P (1970). Observations on pollen harvesting by brush tongued lorikeets. Australian Journal of Zoology 18. 427-37.

1.4.5 Mead, R J, Oliver, A J & King D R (1970). Metabolism and defluorination of fluoracetate in the brush tailed possum (Trichosurus vulpecula) Australian Journal of Biological Sciences 32, 1, 15-26.

1.4.6 Perry, D H (1973). 'Some notes on the decline and subsequent recovery of mammal populations in the south west of Western Austraia.' Western Australian Naturalist 12.6, 128-130.

1.4.7 Kabay, E D & Start, A N (1975/76). Results of the search for the Potorod in the south west and the south coast of Western Australia. Unpublished Report. Dept of Fisheries and Wildlife.

1.4.8 Hindmarsh, R (1976). The effects of prescibed burning in the forests of south western Australia on the invertebrate fauna, and its possible relation to the delayed recovery in the population of Antechinus flavipes. WAIT Student Biology Project No 302 85 pages.

1.4.9 Christensen, P E S & Kimber P C, (1977). Mammals of Western Australian Forests. Forests Dept Information Sheet No 5.

1.4.10 Mees, G F (1977). The status of Gambusia affinis (Baudand Giraud) in south western Australia. Records of the Western Australian Museum.

1.4.11 Forests Dept (1977). Fauna of the forest floor in the south west of Western Australia Information sheet. Forests Dept of Western Australia.

1.4.12 Morrisy, N M (1978). The past and present distribution of marron Cherax Tenuiramis (Smith) in Western Australia. Dept of Fisheries and Wildlife. Research Bulletin No 22 1-38 Perth.

1.4.13 Christensen, P (1978). The introduced European Red Fox. (Vulpes vulpes). A serious threat to native mammals in the South West. Unpublished Report Forests Dept of WA.

1.4.14 King, D R, Oliver, A J & Meed, R J (1978). The adaption of some Western Australian mammals to food plants containing fluoracetate. Australian Journal of Zoology 26.4, 699-72.

1.4.15 McDawall, R M (1978). A new genes and species of Galaxis fish from Australia. (Salmoniformes-Galaxiidae). Journal of the Royal Society of New Zealand. 8, 1, 115-24.

1.4.16 Coy, N.J (1979). Freshwater fishing in south west Australia. Jabiru Books. Perth.

1.4.17 Oliver, A J, King, D R & Mead, R J (1979) 'Fluoroacetate tolerance, a genetic matter in some Australian mammals.' Australian Journal of Zoology. 27.3, 363-72.

1.4.18 Sawle, M (1979). Habitat components of Antechinus flavipes (Waterhouse 1838) in Karri (Eucalyptus diversicolor) forest south west of Western Australia. Honours Thesis. Dept of Environment and Life Sciences. Murdoch University, West. Aust.

1.4.19 Christensen, P (1980a). A Sad Day for Native Fauna. Forest Focus No 23, 3-12. Forests Dept of WA.

1.4.20 Christensen, P & Leftwich, T (1980). Observations on nesting habits of the brush tailed at Kangaroo or woylie (Beltongia peniculata). J. Royal Soc. WA 63, 2, 33-38.

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APPENDIX 3

List of Commitments made by WA Chip & Pulp Co Pty Ltd
in the Supplement to the ERMP

LIST OF COMMITMENTS MADE BY WA CHIP AND PULP CO PTY LTD
IN THE SUPPLEMENT TO THE ERMP

WACAP'S COMMITMENT TO THE SOCIAL ENVIRONMENT

- WACAP makes a firm commitment to continue supplying the world's paper industry with this specialised resource.

- WACAP is committed to maintain and strengthen its contributions to the Regional, State and Australian economies.

- WACAP is committed to expanding its role in supporting the people of Australia, particularly those in the south-west region.

WACAP'S COMMITMENT TO THE NATURAL ENVIRONMENT

- WACAP sees its role as including the task of educating the general public that its operations are carried out within a framework of environmentally protective regulations and practices. These are based on continuing scientific research into the environmental effects of modern forest management.

- WACAP accepts a responsibility to continue to utilise the natural paperwood resource obtained from forest residue left behind from harvesting of sawable timber in the south-west forests, and to ensure that its activities and operations within the broader context are consistent with genuine conservation of that resource in terms of the definition of conservation referred to in Section 7.1, with respect to protection and enhancement of the forest environment.

WACAP Environmental Commitments in State Forests

- WACAP will observe all controls and operating conditions imposed on it through the published codes, Acts and licences listed above.

- WACAP will require that all its harvesting contractors engaged to harvest logs and deliver them to the Diamond Mill be familiar with the contents of CALM's management policies and regulations, and agree to abide by them.

- WACAP will report to CALM any incidences of malpractice that come to its attention. Penalties for breaches of regulations will be the responsibility of CALM.

- WACAP will monitor the effectiveness of the various management procedures and will, if necessary, make recommendations to CALM, the EPA or other relevent bodies, to further improve and strengthen the effectiveness of these documents in achieving their goals.

- WACAP will support the education and instruction of all forest workers in appropriate levels of conservation knowledge and skills.

Conservation of Ecological Values

- WACAP will comply and co-operate with all authorities under the W.A. Government and will abide by the newly promulgated Timber Strategy and Regional Management Plans and any documents relating to them.

- WACAP will respect the annual harvest quotas from State forest established by CALM on the basis of sustainable yield.

- WACAP will respect the boundaries of the various kinds of forest areas (such as State Forest, Timber Reserves, National Parks, Nature Reserves and Conservation Parks) as demarcated by CALM or other government departments.

- WACAP will ensure that any permitted tree harvesting is confined within the boundaries laid down by CALM.

- WACAP will adhere to CALM's directions with respect to harvesting operations for subsequent optimal forest re-growth.

- WACAP will avoid any forest practices contrary to sound forest development as specified by CALM.

Water Quality

- WACAP will continue its co-operative and cordial relations with the appropriate authorities - CALM and the Water Authority of Western Australia.

- WACAP will continue its corporate membership of the WAWA's Water Quality Research Committee initiated in 1986, or any replacement or similar committee.

- WACAP will retain buffer zones demarcated by CALM.

- WACAP will observe proper management in all phases of operation to avoid excessive movement of soil (refer to section 7.3.1.8).

- WACAP will continue to be responsible for the construction and maintenance of the primary log haul routes, giving due consideration to factors such as:
  - topography,
  - drainage pattern,
  - slope,
  - erosion hazard,
  - dieback hygiene, and
  - safety

  subject to CALM responsibility to approve location of the routes.

- WACAP will continue to minimise soil erosion on road-ways in winter conditions by:
  - sealing major log road surfaces in susceptible flat areas, and
  - spreading ground cover on susceptible drainage gullies beside roads.

- WACAP will continue to direct main road runoff into forest area to allow settlement of any dust or gravel carried by the water.

- WACAP will continue to co-operate with CALM and all other relevant authorities in preventing and controlling bush fires. This will help minimise the turbidity of streams that can occur when wild-fires destroy vegetation and expose soils to erosion through wind and rain (refer to section 7.3.1.4).

- WACAP will continue to recycle mill process water to the furthest practicable extent.

- WACAP will continue to contain liquid outflow in storage dams.

- WACAP will continue to ensure that periodic excess water discharge into nearby waterways is carried out in accordance with the provisions of the Effluent Disposal Licence granted by the Environmental Protection Authority of Western Australia.

- WACAP will monitor potential leachates from the paperwood stockpile and take corrective action to mitigate water quality impact if required (refer to section 7.3.1.11).

Protection of Forest Productivity

- WACAP will promote overall forest productivity by adhering to the recommended silvicultural management programme laid down by CALM.

- WACAP will minimise the erosion of forest soils by avoiding excessive movement of soil during harvesting and road construction (refer to section 7.3.1.8).

- WACAP will continue to coordinate the rehabilitation of compacted soil on behalf of the timber industry, by:
  - ripping landings and major snig tracks to a depth of approximately 0.5m,
  - arranging the bulldozer and driver,
  - servicing the machine, and
  - programming the sequence of operations.

- WACAP will employ forest hygiene procedures as recommended by CALM to minimise spread of diseases, weeds or pests.

- WACAP will monitor to avoid damage to retained trees during harvesting.

- WACAP will report known incidences of contractors violating the terms of the Code of Logging Practice, although the imposition of penalties will be the responsibility of CALM.

- WACAP will make recommendations to CALM for improvements which will lead to protection of forest productivity.

Fire Prevention and Control

- WACAP will retain appropriate buffers, as demarcated by CALM.

- WACAP will maintain contant vigilance for wildfire outbreaks, and alert appropriate authorities.

- WACAP will train company personnel in fire-fighting procedures and provide fire-fighting equipment in emergencies.

Recolonisation by Flora and Fauna

- WACAP will respect the boundaries of forest reserves of all kinds as determined by CALM, including:
  - road reserves,
  - river and stream reserves,
  - National Parks, and
  - other classes of reserve.

Genetic Diversity

WACAP is committed to co-operating with CALM in maintaining genetic diversity of the State forests. CALM is responsible for this through utilisation of seed trees, control of seed collection and planting, through its system of reserves and through its wood production and silvicultural practices.

Landscape Values

- WACAP will retain appropriate buffer zones where required by CALM.
- WACAP will plan haulage road placement taking into consideration the visual aspects of the road (See section 7.3.1.9).
- WACAP will apply prescribed remedial treatments to aid forest regrowth.

Soil Protection

- WACAP will respect "Special Care Zones" comprising all slopes greater than 20 degrees or slopes exceeding 15 degrees if they border on recognised water courses.
- WACAP will restrict harvesting activities in these zones to a narrow range of soil moisture conditions.
- WACAP will minimise machine movements.
- WACAP will avoid downhill snigging and scrub-rolling except where this is impractical.
- WACAP will complete soil rehabilitation prior to the first winter after regeneration burning.

- WACAP will locate log landing and loading areas more than 50m from recognised water courses, except where this is impractical.

- WACAP will lay snig tracks parallel to recognised water courses except where this is impractical, and will not cross them unless unavoidable.

- WACAP will not allow logging roads to enter stream reserves except where this is impractical and approved by CALM, in which case bridges or culverts will be installed.

- WACAP will apply stabilising treatments to minimise erosion of sites which may be at risk (those close to water courses), such as spreading bark on disturbed areas, and installing silt traps.

- WACAP will install cross drains across snig tracks and roads at the completion of harvesting, in accordance with the Industry Control Specifications.

- WACAP will strive to minimise soil disturbance and will observe the specifications designed for this purpose, including cessation of activities during or immediately following heavy rain.

- WACAP will ensure that contractors involved in falling and snigging trees in areas designated by CALM continue to obey the rules laid down by CALM in the Code of Hardwood Logging Practice.

Haulage Roads

- WACAP will prepare plans for its haulage roads constructed by WACAP contractors with a view to safeguarding many factors, including:
  - public safety,
  - erosion avoidance, and
  - noise reduction.

- WACAP will submit these plans to CALM for approval at least 2 months prior to clearing for in-coupe roads, and at least 3 months prior to clearing for major roads. These plans will show:
  - proposed road alignments or alternatives,
  - the differentiation between new clearing and upgrading of existing roads,
  - proposals for creek or river crossings,
  - location of proposed gravel pits with details of quantities to be extracted.

- WACAP will mark the route in the field at least 6 weeks prior to clearing, following approval of these preliminary plans.

- WACAP will locate the roads based on consideration of various factors, including:
  - disease,
  - erosion,
  - sedimentation,
  - safety, and
  - visual amenity.

- WACAP will observe CALM's specifications which include maximum clearing widths of 12m for major roads and 8m for in-coupe roads.

- WACAP will observe the detailed specifications for minimisation of erosion (see Section 7.3.1.8) and for installation of drains and silt traps to control runoff and sedimentation from roads and borrow pits.

- WACAP will maintain these roads by:
  - clearing culverts and silt traps, and
  - slashing scrub to maintain visibility.

- WACAP will minimise inconvenience and risks to other users of the forest by:
  - utilising the private timber road system to the maximum extent possible,
  - monitoring traffic control, and
  - installing hazard warning signs for the protection of the public.

Recreation

- WACAP will have regard for landscaping and visual amenity (section 7.3.1.7),

- WACAP will use private forest roads as much as possible to separate industrial traffic from tourist traffic.

- WACAP will contribute to maintaining ecological values (section 7.3.1.1),

- WACAP will provide and maintain appropriate safety direction and information signs.

- WACAP will contribute to enhancing water quality (section 7.3.1.2),

- WACAP will contribute to the optimal growth of new forests (section 7.3.1.3),
- WACAP will co-operate in preventing and controlling wildfires (section 7.3.1.4), and
- WACAP will contribute to conserving the flora and fauna of the region (section 7.3.1.5) including genetic diversity (section 7.3.1.6)
- WACAP will continue to encourage the public to inspect its facilities at the Diamond Mill, which is a popular local tourist attraction in its own right.

Mill and Port Operations

- WACAP will continue to recycle liquid outflow to the maximum extent possible.
- WACAP will carry out discharge of excess quantities, when necessary, in accordance with the terms of the Effluent Disposal Licence issued by the Environmental Protection Authority.
- WACAP will minimise water quality impact in the unlikely event that leachate is detected from the paperwood stockpile.
- WACAP will continue to comply with applicable noise regulations.
- WACAP will continue to require employees exposed to potentially damaging noise levels to use hearing protection equipment.

Utilisation Standards

- WACAP will prevent logs or parts of logs being processed into paperwood, if they could be commercially utilised as sawn timber.
- WACAP will ensure that contractors on-site in forest coupes accurately separate logs into piles of either sawlogs or paperwood logs, according to the criteria laid down by CALM.
- WACAP will encourage sawmillers to reclaim logs from paperwood log piles in the forest landings, for production into sawn timber.

- WACAP will co-operate with CALM officers to ensure that paperwood logs delivered to the Diamond Mill are indeed below sawlog quality. WACAP will set aside any logs which WACAP consider to have saw milling potential for inspection by CALM officers and sawmillers.

- WACAP will utilise the new process developed at its own initiative which recovers sections of paperwood logs that contain potential "saw-wood", and will make this available to CALM at regular intervals, for auction to saw millers.

- WACAP will monitor the performance of its machinery to ensure that recovery of products is maximised.

- WACAP will continue its policy of full public disclosure of the log selection and utilisation procedures laid down by CALM. Public tours showing all aspects of the operation are available.

- WACAP will encourage all workers in the forest to take instruction on maximum utilisation procedures and will support such instruction.

WACAP Environmental Commitments on Private Property Owned by WACAP

- WACAP will comply with the requirements of the Country Areas Water Supply Act (1947-78) by:
  - obtaining licences to clear any land in declared water catchment areas,
  - abiding by the conditions of any licence, and
  - maintaining the trees in a responsible and professional manner.

- WACAP will comply with the Soil and Land Conservation Act (1945-82) by:
  - obtaining licences for clearing native trees covering an area greater than 1 hectare,
  - complying with the conditions of these licences,
  - ensuring that its operations, even if not restricted by a licence, do not cause land degradation.

- WACAP will comply with the Bush Fires Act (1954-79) by:
  - establishing firebreaks on external boundaries of at least the minimum width as specified in each Shire,
  - establishing internal subdivision firebreaks as specified by the relevent Shire,
  - obtaining necessary permits to light fires for whatever reason, and
  - obeying the instructions of any duly authorised officer in the case of a bush fire.

- WACAP will continue to manage young regrowing native trees on land purchased by WACAP, should those trees, in WACAP's opinion, be of sufficient quality and quantity for retention as future sawlogs and paperwood trees.

- WACAP will develop a code of harvesting practice based on CALM's Code of Hardwood Logging Practice and its complementary Manual of Hardwood Logging Specifications and other similar codes in force in other parts of Australia. This code will include management practices for:
  - river and stream crossings,
  - road construction,
  - road drainage,
  - log storage and sorting area placement,
  - snig track placement,
  - soil disturbance during wet weather,
  - rehabilitation of log storage and sorting areas,
  - harvesting of steep slopes,
  - maximum utilisation of each tree, and
  - retention of vegetation alongside perennial and other recognised streams.

- WACAP will ensure the maximum commercial utilisation of each tree by:
  - selling all sawlogs produced to sawmillers, be they general purpose or salvage quality,
  - holding auctions of any logs which WACAP considers to have sawlog potential but which are not taken by sawmillers from the land,
  - segregating the classes of logs at the storage and sorting areas so that accidental inclusions of sawlogs into paperwood is either nil or minimal, and
  - checking and segregating possible sawlogs or saw-wood sections after delivery to the Diamond Mill.

- WACAP will ensure that its contractors conduct their business in a safe manner, whether they be conducting harvesting, routine management, or planting activities. Where there are potential hazards, contractors will be required to place notices of such where the public may be endangered (ie: signs warning of trucks entering the public road from private property).

- WACAP will continue to take reasonable precautions to minimise fire damage by:
  - discussing with officers of the Bush Fires Board,
  - becoming financial members of the local fire brigade in each area where WACAP has a plantation,
  - liaising with Shire appointed fire officers, and
  - maintaining fire fighting equipment in its own right.

- WACAP will continue to establish trial and demonstration plantings aimed at increasing the efficiency of tree establishment, growth and harvesting and will inform other landowners of such improvements.

- WACAP will ensure the genetic diversity and integrity of the tree farms under its supervision by maintaining controls on the use of seed in regeneration.

WACAP Environmental Commitments on Private Property Owned by Others, Mainly Farmers

- WACAP will continue to liaise with bodies such as the Western Australian Farmer's Federation (WAFF) to educate and motivate farmers into establishing tree plantations on private property.

- WACAP will develop a "Code of Harvesting Practice" for contractors harvesting wood from private property where the subsequent land use is tree farming, and will request that participants of WACAP's various Tree Farming Incentive Schemes adopt this code. The code will be similar to that being developed on WACAP's private land, based on CALM's Code of Hardwood Logging Practice and its complementary Manual of Hardwood Logging Specifications and other similar codes in force in other parts of Australia. The code will include management practices for:
  - river and stream crossings,
  - road construction,
  - road drainage,
  - log storage and sorting area placement,
  - snig track placement,
  - soil disturbance during wet weather,
  - rehabilitation of log storage and sorting areas,
  - harvesting of steep slopes,
  - maximum utilisation of each tree, and
  - retention of vegetation alongside perennial and other recognised streams.

- WACAP's supervisors will visit the site of harvesting operations on private property to monitor production.

- WACAP's supervisors will administer the code and enforce penalties to the extent of WACAP's authority.

- WACAP will reduce paperwood supply quotas of harvesting contractors who do not carry out the harvesting operation in an acceptable manner.

- WACAP will engage additional qualified staff as required.

- WACAP will continue to rigorously enforce safety rules and regulations covering private harvesting operations and road rules, including the compulsory wearing of:
  - hard hats,
  - safety boots, and
  - hearing protection.

- WACAP's supervisors will impose any penalties which are legally enforceable by WACAP along the lines of:
  - initial warnings,
  - suspensions, or
  - life time bans from working as a supplier to WACAP.

- WACAP will continue to support afforestation of previously cleared land and reforestation of newly harvested areas, through differential incentive payments and technical assistance to landholders.

- WACAP will not accept paperwood logs from private land unless the landholder demonstrates that the necessary Government permits-to-clear have been obtained.

- WACAP will not solicit logs from private sources and will continue to pay only modest stumpage rates for the paperwood which it purchases from landowners clearing for agricultural purposes, thus minimising the incentive for the private landowner to clear native forest for agricultural purposes.

- WACAP will continue to reduce air pollution and convert a residue product into a marketable resource, by encouraging private landowners to salvage cleared timber which would otherwise be burnt (once a decision to clear land has been made by the private landowner).

- WACAP will furthur offset the impact of pasture clearing by establishing a minimum of 5ha of tree plantation for every 1000 tonnes of paperwood it receives from private property, including WACAP-owned land. These tree plantations will be established either on WACAP-owned land, or on other private land through one of it's private Forestry Incentive Schemes.

ARCHAEOLOGICAL AND ETHNOGRAPHIC SITES

- WACAP will take measures to inform all personnel associated with the woodchipping activities of their obligations under the Act.

- WACAP will modify its operations in accordance with CALM directions, if necessary, to avoid damage to Aboriginal sites.

RESEARCH

- WACAP commits to continuing either sponsorship or self-conducted research aimed at, among other things:
  - improved tree establishment procedures,
  - improved tree protection procedures,
  - improved tree growth,
  - improved utilisation of timber produced,
  - improved harvesting techniques,
  - new products manufactured from trees,
  - new manufacturing processes,
  - establishing new markets for products,
  - maintaining existing markets for products, and
  - adjusting current practices if better management techniques are indentified and quantified.

- WACAP will encourage and agitate for more research effort by CALM into improving the growth, health and quality for sawlog and paperwood use of CALM's native trees and production forests.