

**Clearing of native vegetation on Victoria
Location 10641 Coorow - Greenhead Road,
Shire of Coorow**

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**Report and recommendations
of the Environmental Protection Authority**

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3. E. A. Griffin (1998a) A brief review of the nature conservation values of remnant vegetation on Victoria Location 10641. Unpublished report for the Department of Environmental Protection. AGWEST Land Management Job 98/155.
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Summary and recommendations

The proponent has notified to clear 250 hectares of native vegetation on Victoria Location 10641, Coorow - Greenhead Road, Shire of Coorow. This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for the Environment on the environmental factors relevant to the proposal.

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

Relevant environmental factors

Although a number of environmental factors were considered by the EPA in the assessment, it is the EPA's opinion that the following are the environmental factors relevant to the proposal, which require detailed evaluation in the report:

- (a) plant diversity and species richness;
- (b) Declared Rare and Priority Flora;
- (c) regional representation of vegetation;
- (d) vegetation and fauna corridors (including contextual values); and
- (e) viability of remnant vegetation on the property.

Conclusion

The EPA has considered the proposal by the proponent to clear 250 ha of native vegetation on Victoria Location 10641. During the course of this assessment, the proponent has indicated a willingness to reduce the area of vegetation proposed to be cleared to 215 ha, to retain vegetated corridors between areas of remnant vegetation on the property.

The EPA commends the proponent's willingness and initiative in modifying the proposal in order to reduce potential environmental impacts.

However, following careful evaluation of specialist botanical advice, the EPA considers that all the vegetation proposed to be cleared should be retained because of its conservation value, particularly its corridor value in providing a non-continuous link between a nature reserve and a national park, and contribution to species richness and endemism in the region.

Accordingly, the EPA's preferred position is that the vegetation proposed to be cleared be protected in a secure conservation reserve system. If this preferred outcome cannot be achieved, the EPA considers that some clearing could be permitted to proceed provided that an area of native vegetation is retained which includes the portions with identified high species richness, which provide adequate protection for priority species, and which maximises the benefit of a corridor between Lesueur National Park south of the property and South Eneabba Nature Reserve to the north. The area recommended to be retained is illustrated in Figure 5 of this report. The EPA is aware that the area recommended to be retained is greater than the area proposed to be retained by the proponent.

The EPA believes that this position would restrict the clearing of native vegetation to approximately 135 ha, as opposed to the modified area of 215 ha proposed to be cleared by the proponent.

Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister considers the report on the relevant environmental factors of plant diversity and species richness, Declared Rare and Priority Flora, regional representation of vegetation, vegetation and fauna corridors (including contextual values), and viability of remnant vegetation on the property, as set out in Section 3 of this report.
2. That the Minister notes that the EPA considers that the vegetation proposed to be cleared should be retained because of the location of this vegetation in providing a non-continuous link between a national park and a nature reserve, and in particular its corridor value and contribution to species richness and endemism in the region.
3. That the Minister notes that the EPA's preferred position is that the land be protected in a secure conservation reserve system.
4. That the Minister notes that the EPA considers that if this preferred outcome cannot be achieved, the proposal could be permitted to proceed provided that an area of native vegetation is retained which includes the portions with identified high species richness, which provides adequate protection for priority species, and which maximises the benefit of a corridor between Lesueur National Park south of the property and South Eneabba Nature Reserve to the north. The area to be retained is illustrated in Figure 5 of this report.
5. That the Minister notes that the EPA believes that this position would restrict the clearing of native vegetation to approximately 135 ha, as opposed to the modified area of 215 ha proposed to be cleared by the proponent.
6. That the Minister notes the concerns expressed by the proponent regarding assessment of his land clearing proposal presented in Appendix 5 of this report.
7. That the Minister notes that the EPA intends to provide advice, as early as possible, on actions which could be adopted by the Government to improve the assessment and processing of land clearing applications

1. Introduction and background

This report is to provide advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment on a proposal to clear native vegetation for agricultural purposes in the West Midlands area.

The proponent has notified to clear 250 ha of native vegetation on Victoria Location 10641 within the Shire of Coorow. He intends to use the cleared land for grazing and cereal production.

The EPA is aware that the proponent previously submitted a Notice of Intent to Clear (NOIC) a portion of his property in 1988. It is understood that there was no objection to the proposed clearing at that time, however, not all of area notified was cleared. The proponent subsequently re-notified to clear to the Commissioner for Soil and Land Conservation in August 1995.

In view of the potential impacts of the proposed clearing on native flora, the proposal was forwarded to the Inter Agency Working Group for consideration in accordance with the 'Memorandum of Understanding (MOU) for the protection of remnant vegetation on private land in the agricultural region of Western Australia' in May 1997. As there was inadequate information to determine the impact on native flora, a botanic survey was commissioned by the Department of Environmental Protection (DEP) to determine whether rare and / or priority flora were present on the property. A report prepared by Matiske Consulting Pty Ltd (Matiske, 1997) confirmed the presence of priority flora, and the proposal was subsequently referred by the Inter Agency Working group to the EPA in December 1997. The EPA determined that the potential environmental impacts were sufficient for the proposal to be formally assessed under the provisions of Part IV of the Environmental Protection Act, in April 1998.

Further details of the proposal are presented in Section 2 of this report. Section 3 discusses the environmental factors relevant to the proposal while, Section 4 presents other advice the EPA considers relevant to this assessment. The EPA's conclusion is presented in Section 5 and the EPA's recommendations in Section 6.

2. The proposal

The proponent notified to clear 250 ha of native vegetation on the north eastern portion of Victoria Location 10641. The property is approximately 1770 ha in area, and is located 11 kilometres west of the Brand Highway on the Coorow - Greenhead Road (Figure 1). He intends to use the cleared land for pasture / grazing and cereal production.

This vegetation proposed to be cleared is part of a large intact block of vegetation of approximately 300 ha. A total of approximately 423 ha of vegetation (approximately 24 %) would remain on the property after the proposed clearing, as indicated in Figure 2.

The location of the property in relation to existing nature reserves and national parks is indicated in Figure 3.

During the course of this assessment, the proponent has indicated a willingness to reduce the area of vegetation proposed to be cleared to 215 ha, to improve vegetation corridor linkages on the property and reduce the potential environmental impacts of his proposal. This modified proposal is indicated in Figure 4.

3. Environmental factors

3.1 Relevant environmental factors

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

Whilst the NOIC for Location 10641 was lodged with the Commissioner for Soil and Land Conservation before the MOU was formally adopted, the EPA is of the view that the proposal should be considered in general accordance with the principles and criteria of the MOU.

It is the EPA's opinion that the following are the environmental factors relevant to the proposal, which require detailed evaluation in this report:

- (a) plant diversity and species richness;
- (b) Declared Rare and Priority Flora;
- (c) regional representation of vegetation;
- (d) vegetation and fauna corridors (including contextual values); and
- (e) viability of remnant vegetation on the property.

Table 1 presents a summary of the relevant environmental factors.

A report prepared by Mattiske Consulting Pty Ltd (November 1997) for the DEP entitled 'Rare and Priority Flora Search on Victoria Location 10641' was used by the EPA during this assessment and is included as Appendix 2 to this report.

As part of the assessment of this proposal, the EPA also sought advice from Mr T. Griffin, who is a botanist with specialist knowledge of vegetation in the Mt Lesueur area. Griffin's reports entitled 'A brief review of the nature conservation values of remnant vegetation on Victoria Location 10641 - Unpublished report to the Department of Environmental Protection', and 'Interim Bioregions West Midlands - Unpublished report to the Department of Environmental Protection' are included as Appendices 3 and 4 to this report.

The relevant environmental factors are discussed in Sections 3.2 to 3.6 of this report.

3.2 Plant diversity and species richness

Description

Location 10641 is located north of the Lesueur National Park, as indicated in Figure 3. EPA Bulletin 424, entitled 'Nature Conservation, Landscape and Recreation Values of the Lesueur Area' (Burbidge et al., 1990) has been used by the EPA during the assessment of this factor.

Technical information provided Mattiske Consulting Pty Ltd (Mattiske 1997) and the specialist advice of Griffin has also been used.

Assessment

Chapter 12 of Bulletin 424 refers to the significance of the Lesueur National Park and surrounds, which has been identified as an area of world, national, State and regional nature conservation significance (Burbidge et al. 1990, p. 111).

Importantly, the report states that the major characteristics of the Lesueur National Park and surrounds include its uniqueness in terms of high numbers of endemic plants; biodiversity as it includes high numbers of vascular plants and vertebrate animals; high nature conservation value as it includes vegetation associations and species not protected within other reserves; and its size.

The report also states that Lesueur National Park and surrounds is not considered to be large for an important conservation reserve, and that 'desirably it should be larger'.

'At 27 500 ha, the Lesueur National Park is not large for an important conservation reserve; desirably it should be larger. If a conservation reserve for the Lesueur Area was to be designed without any consideration for existing land tenure, it would include most of the area between Nambung National Park, Badgingarra National Park, Alexander Morrison National Park and South Eneabba Reserve. However, much of this area is now

freehold and cleared for farming. This does not mean that the Lesueur National Park is not extremely valuable, it reinforces the need to retain as much as possible of this larger area in nature conservation reserves.' (Burbidge et al. 1990, p. 111).

Chapter 12 of Bulletin 424 describes the Lesueur National Park within a State-wide context.

'The Lesueur Area (now Lesueur National Park) lies at the centre of one of three nodes of extraordinary species richness and endemism in the south-west of the State. The other two nodes are the Stirling Range National Park and the Fitzgerald River National Park, both of which are infected with P. cinnamomi as well as several other Phytophthora species.' (Burbidge et al. 1990, p. 113).

The Northern Sandplain (Kwongan) has long been recognised as having a high species richness which can be measured in a number of ways. George et al (1979) measured it as the number of species in a standard area. They found that this richness measure varied by vegetation type and geography. The vegetation on laterite heath and some sands is generally the richest on this basis. Peak values are about 100 species per 100 m² (Griffin pers com). Areas where these richest values have been recorded are concentrated in the Lesueur and Eneabba areas.

Chapters 5.4 and 5.6 of Bulletin 424 discuss the species richness of vascular flora of the Lesueur National Park. The Kwongan sandplain in the vicinity of the Lesueur National Park is known to have an extraordinarily high species richness, where most vegetation types have over 80 species per 100 m², which may increase by as many as 10 species just after a fire (Burbidge et al. 1990). This is thought to be due to the large numbers of endemic species, the wealth of habitats present, the varied topography and the range of geological substrates.

Location 10641 lies in an area of moderate richness of endemic species (see Figure 5.3, Burbidge et al. 1990). The finding of seven priority species on Location 10641 during the limited survey by Mattiske (1997) supports this conclusion. The EPA has been advised that in view of the findings of the Mattiske survey, and information presented in Bulletin 424, this property is probably richer in these endemic species than much of the region except the exceptionally rich Lesueur and Eneabba areas. Areas on Location 10641 likely to be rich in endemic species include sites where vegetation grows on lateritic soils, on both the residual upland and the colluvial slopes. It is understood that these sites probably carry in the order of 80 species per 100 m². Some vegetation growing on sand is likely to have a lower species richness, but in some cases greater than 60 species per 100 m².

The EPA notes that the Department of Conservation and Land Management has advised that the property has significant conservation value.

The EPA has concluded that in view of the species richness and endemism of the Kwongan vegetation in the region, of which this property is likely to be an integral part, it is appropriate from a biodiversity perspective to retain the vegetation on the property because of its contribution to species richness and endemism in the region. This view is consistent with 'The National Strategy for the Conservation of Australia's Biological Diversity', signed by the Premier on behalf of the Western Australian Government (Commonwealth of Australia, 1996).

If this preferred outcome cannot be achieved, the EPA considers that the proposal could be permitted to proceed provided that portions of native vegetation are retained which include areas with identified highest species richness and endemism.

3.3 Declared Rare and Priority Flora

Description

An evaluation of native vegetation on the property was initially undertaken by Agriculture Western Australia (AgWA) officers following submission of the NOIC by the proponent. This evaluation indicated that declared rare and priority flora may be present on the property.

A survey was commissioned by the DEP and undertaken by Matiske Consulting Pty Ltd in November 1997 (Matiske 1997) confirmed the presence of priority flora. The EPA has also taken into consideration advice provided by Griffin with respect to this factor (Griffin 1998a).

Assessment

The survey undertaken by Matiske Consulting Pty Ltd in November 1997 involved a limited and targeted search for rare and priority flora species. During the survey, no species declared as Rare Flora under the Wildlife Conservation Act were found, however seven priority species were located on the property.

Priority species identified were located around the edge of an area of lateritic duricrust on the property. The EPA appreciates that it was not the intention of the proponent to clear this portion of the property. However, the Matiske report concluded that if the proposed clearing was to occur, a further survey of declared rare and priority flora should be undertaken, preferably in spring.

Griffin subsequently visited Location 10641 in September 1998 and attempted to define the portions of remnant vegetation which should have priority for protection if some clearing were to take place (Griffin 1998a). He concurred with the findings of the Matiske report in stating that the lateritic uplands and colluvial slopes are the most likely areas of remnant vegetation where rare or priority species may be found.

Griffin identified a sizeable population of the priority species *Hakea neurophylla* not noted by Matiske Consulting Pty Ltd (1997), part of which is in the area proposed to be cleared. Typically this species occurs with other priority and rare species in the Lesueur National Park, and other species might be with it in Location 10641. This area should also be protected.

The occurrences of two other species (*Xylomelum angistofolium* and *Eucalyptus tetragona*) are of scientific interest because they are close to the southern limit of their distribution in the Lesueur area. More detail with respect to these species is included in Appendix 3. The location of these flora species is indicated in Figure 5.

The EPA has reviewed the above advice and considers that, in view of presence of priority species on the Location 10641 and the high species richness of the remaining flora, all the vegetation proposed to be cleared should be retained and protected in a secure conservation reserve system.

If this preferred outcome cannot be achieved, the EPA considers that the proposal could be permitted to proceed provided that portions of native vegetation are retained which include the priority flora species, and that an appropriate buffer is retained to protect them.

3.4 Regional representation of vegetation

Description

Vegetation of the Dandaragan-Lesueur area has not been mapped in detail. This presents difficulties in determining how adequately vegetation types are represented by remaining remnant vegetation within the region, and particularly in conservation reserves. Beard (1979) has mapped the vegetation of Western Australia based on an interpretation of vegetation structure and associations correlated against mapped geological surface types. From this basis, Beard has defined a series of vegetation units. These were defined by a few dominant species.

Within the Dandaragan region, the mapping was undertaken on a scale of 1:250,000. Each mapped unit, therefore, would normally include several vegetation types.

The EPA considers that it is difficult to make a judgement on the representativeness of vegetation on a particular property within the region at this scale of mapping. The vegetation types of the Dandaragan-Lesueur area are structurally similar (low shrub dominated) but are highly variable in composition. Assessment of these areas requires detailed analysis of how the floristic composition changes. Griffin (1994) has undertaken a study over much of the area which provides a basis for a regional assessment. The only difficulty is to provide a geographic distribution to that analysis. Griffin (1998b) has subsequently developed interim bioregions based on a correlation with the soil-landscape mapping systems prepared by AgWA. This mapping is prepared from interpretation of aerial photos at the scale of 1:20,000 to 1:50,000. This approach has also been taken for vegetation mapping on the Swan Coastal Plain.

Location 10641 straddles the boundary between two bioregions, the Gairdner and Yerramullah. The Gairdner is a localised bioregion which is well conserved in the Lesueur National Park. The Yerramullah bioregion (as indicated in Figure 3) includes soil types characteristic of the Cataby to Gingin soil system and is moderately well conserved in a number of conservation reserves, eg Badgingarra National Park, Coomallo and South Eneabba Nature Reserves. However, there is significant variation in the vegetation within the Yerramullah bioregion and three subregions have been identified, i.e. Yerramullah North, Yerramullah South and Yerramullah West (Griffin, 1998b).

As highlighted by Griffin, in view of the diversity of plants in this region (refer to Section 3.2 of this report), even this level of mapping does not enable highly confident assessment of the representativeness of any particular patch of vegetation within the rest of the region.

Assessment

The remnant vegetation within Location 10641 is considered to be typical of the Gardiner and Yerramullah North bioregions (Griffin 1998a and b). This vegetation is not considered to be well represented in the existing conservation estate. Approximately 12 % of vegetation characteristic of the Yerramullah North sub-bioregion is included within existing conservation reserves. However, there are significant areas of Yerramullah North vegetation in other Crown land which, if included in the conservation estate, would represent over 20% conserved.

The EPA concludes that the portion of Location 10641 proposed to be cleared probably contains vegetation which is not well represented in the existing conservation estate. The EPA therefore considers that the vegetation covered by the proposal should be retained and protected in a secure conservation reserve system.

If this preferred outcome cannot be achieved, the EPA considers that the proposal could be permitted provided an adequate area was retained which ensured improved protection of this significant vegetation.

The EPA notes that there is other vegetation in the Yerramullah North sub-bioregion which is on Crown land and is not reserved for conservation purposes. The EPA recommends that consideration should be given to including this Crown land in a conservation reserve to increase the representation of vegetation in conservation reserves in the region.

3.5 Vegetation and fauna corridors (including contextual values)

Description

A corridor can be defined as 'a linear feature of vegetation which differs from the surrounding vegetation and connects at least two patches, which were connected in historical time' (Saunders and Hobbs, 1991). When considering faunal movement, the important component is that it allows movement *from* somewhere *to* somewhere (Hobbs, 1992).

Extensive clearing of native vegetation has occurred in the Lesueur - Dandaragan region in past years. However, a number of nature reserves and national parks have been established in the region (Figure 3).

Although the vegetation proposed to be cleared is not directly connected to the Lesueur National Park it is an important part of a non-continuous corridor of remnant vegetation islands between the Lesueur National Park to the south, South Eneabba Nature Reserve to the north, and the Alexander Morrison National Park to the north-east (see Figure 3). As it stands, these remnants are not well connected, however if they were protected they could be considered to be a significant and viable non-continuous corridor for the movement of native fauna.

Assessment

Extensive clearing in the West Midlands district of Western Australia in past years has resulted in a landscape which has a number of fragmented areas of native vegetation remaining. Some of this vegetation is included within conservation reserves. Other areas of remnant native vegetation are still within private ownership, but nevertheless represent significant stands of several hundreds of hectares which provide valuable flora and fauna habitats.

Various research has been undertaken on the relationship between the size of remnant vegetation and corridor values for native fauna movement. This research has been documented in reports such as 'The Role of Corridors' (Saunders and Hobbs, 1991). This report presents a number of research papers on the subject of vegetation corridors which are considered to be applicable to the Australian environment. The advantages of retaining corridors include the fact that they allow organisms and natural ecological processes to maintain biological diversity. (Harris and Scheck in 'The Role of Corridors' 1991, p.189). Another paper expands on the values of vegetation corridors as follows;

'As conduits, linear features or corridors may foster the movement of biota and may change the degree of ecological isolation of populations in fragmented landscapes. If they foster the movement of species dependent on remnant vegetation, corridors will make a positive contribution to conservation' (Saunders and Hobbs in 'The Role of Corridors' 1991, p. 422)

The width of corridors is considered to be particularly important as the edges are vulnerable to outside disturbances including exotic weed invasion and human disturbance. This is known as the 'edge effect'. While it is difficult to be precise in determining an optimum size and/or width of vegetation corridors, where specific species of native fauna is known to occur in the vicinity, an informed decision on an appropriate width can be made by specialists to optimise the possibility of ensuring that the corridor is viable for those species (Hobbs, 1992).

In order to maintain a viable corridor in the long term, and to minimise the 'edge effect', it is generally accepted that a minimum width of several hundred metres is required in order for a remnant vegetation corridor to remain viable in the medium to long term. On Location 10641, the remaining stand of remnant native vegetation proposed to be cleared is generally greater than 600 metres wide at the northern end, and up to 1,000 metres wide at the southern end.

The EPA notes and endorses the view that the retention of vegetation corridors providing a non-continuous corridor link between nature reserves and national parks would add significantly to the environmental values of these conservation areas and aid the protection of native fauna in the region. While the vegetation proposed to be cleared on Location 10641 is not directly connected to the Lesueur National Park it forms part of non-continuous corridor linking the Park to the South Eneabba Nature Reserve to the north, and the Alexander Morrison National Park to the north-east (see Figure 3).

During the preparation of this report, the proponent was given the opportunity to comment on the EPA's views regarding the need to retain vegetation corridors. In response to these concerns, the proponent has indicated to the EPA a willingness to retain a vegetation corridor approximately 100 metres wide, which could link remnant stands of vegetation as indicated in Figure 4. By retaining these corridors, the total area of vegetation proposed to be cleared would be reduced from 250 ha to 215 ha. The EPA commends the proponent's endeavours to incorporate the EPA's concerns with respect to this factor, however it considers that in order for

the corridors to be remain viable in the medium to long term corridor, they would need to be wider. This view is supported by Griffin (1998a), which indicates that any corridor less than 300 to 400 metres wide would be seriously vulnerable to 'edge effects' and damage through accidental firing. Griffin has suggested corridors of an appropriate width, which incorporate buffers to protect areas which have priority species or additional species worthy of protection. These corridors are indicated in Figure 5.

Plant associations in relation to landform and soil type is also an important factor in considering the corridor values of remnant native vegetation. In this case, the vegetation proposed to be cleared is considered to have significance due to its geographical location within the Yerramullah North sub-bioregion, and the fact that the surrounding area is largely cleared. The EPA therefore considers that the vegetation has significant contextual value in terms of the pre-clearing vegetation landscape.

The EPA reiterates that its preferred view is that the vegetation proposed to be cleared should remain uncleared.

If this preferred outcome cannot be achieved, then the EPA considers that the proposal could be permitted to proceed provided that portions of native vegetation be retained so as to maintain the benefit of a non-continuous corridor between Lesueur National Park south of the property and South Eneabba Nature Reserve to the north. Vegetation which the EPA considers should be retained is indicated in Figure 5.

3.6 Viability of remnant vegetation on the property

Description

The total size of Location 10641 is 1770 ha. The vegetation notified to be cleared is part of a large intact block of native vegetation of approximately 300 ha located in the north east portion of the property.

The EPA has referred to a number of papers including 'Management of Remnants of Native Vegetation - A Review of the Problems and the Development of an Approach with Reference to the Wheatbelt of Western Australia' (Main, 1987) as part of the assessment of this factor. Advice provided by Griffin (Griffin, 1998a) has also been used.

Assessment

If the proposed clearing were to proceed, the vegetation remaining on the property would be retained in smaller fragmented portions, as illustrated in Figure 4.

The EPA has been advised that if these remnant vegetation areas were to be retained as proposed, they would have lesser value for nature conservation, in view of their shape and size. It is likely that small areas degrade will degrade over time without active management. The EPA notes that portions of remnant vegetation on Location 10641 have already been fenced at the proponents expense, and this pro-active approach to protect the conservation values of remnants by the proponent is commended. Further, the revised proposal to clear submitted by the proponent in September (Figure 4) improves the viability of remnant stands, however, they are still considered to be vulnerable.

The need to retain remnant portions of vegetation of a reasonable size is supported by Prof. Main (Main, 1987). In this paper Main identifies a number of factors which can have an adverse impact on stands of remnant vegetation. These include:

- changes to the existing hydrological regime, for example rises in the water table, which may lead to waterlogging and or salinisation and 'sheet run off' as a result of adjacent land clearing; and
- changes to the fire regime, as many plant species require regular fires in order to regenerate.

Finally, the 'edge effect'(as discussed in Section 3.5) also needs to be considered. Edges are vulnerable to outside disturbances including exotic weed invasion, livestock grazing and human disturbance, and so the shape of the remnant vegetation block becomes a factor. All these influences need to be considered if remnant vegetation is to retain ecological value in the medium to long term.

The EPA is aware that there is no 'optimum size' for remnant vegetation blocks. However, areas of less than 20 ha are generally considered to be unviable in the long term. They are unlikely to retain their ecological value unless careful consideration is given to the factors identified above and they are managed to minimise outside disturbances, for example fencing to prevent stock grazing, and minimal disturbance through activities such as firebreaks and tracks.

The EPA has also been advised that the whole of the remnant block proposed to be cleared has a good chance of remaining in-tact for a long time if protected, and that the proximity of a small reserve north of the Coorow-Green Head Road adds greatly to the viability of the combined unit.

While the EPA appreciates the proponent's efforts in voluntarily fencing portions of remnant vegetation from stock at his own cost, and modifying the proposal to clear to incorporate vegetation corridors to link remnant stands, the EPA considers that the vegetation proposed to be cleared should be retained as an intact and undisturbed block because of the conservation value, particularly its corridor value in linking a national park and a nature reserve, and contribution to species richness and endemism in the region.

However, if this preferred outcome cannot be achieved, the EPA considers that a portion of vegetation could be cleared, as indicated in Figure 5. This would allow for the clearing of approximately 135 ha.

4. Other advice

During the assessment of this proposal, the EPA met with the proponent to discuss the proposed clearing, and sought comments from him on the draft EPA report and recommendations.

The proponent raised a number of specific concerns with respect to the assessment. A copy of the proponent's comments is provided at Appendix 5. The concerns included:

- time delays associated with approval to clear. It is understood that he applied to clear this property in August 1995, however it was not referred to the EPA for assessment until December 1997;
- the fact that he is prepared to amend his land clearing proposal from clearing 250 ha to 215 ha. This is considered to be a substantial compromise, and indicates his willingness to co-operate with government requirements despite significant time delays in the approval of his proposal. If he is unable to clear this amount of vegetation, he believes that farming at Location 10641 will become economically unviable; and
- if a decision is made which does not allow him to clear, then he believes the only option would be for him as proponent to request government to undertake a property exchange of the whole of Victoria Location 10641 for an equivalent area of productive farm land.

The EPA recommends that the Minister for the Environment notes the proponent's full comments provided in Appendix 5 of the report.

The EPA acknowledges that the development and introduction of the MOU for protection of remnant vegetation in the agricultural region has resulted in excessive delays in considering land clearing applications during the last few years. The EPA is currently working with the other

agencies which are signatories to the MOU to identify means by which the timelines of dealing with land clearing applications could be improved and intends to provide advice to the Minister for the Environment on this matter as early as possible.

5. Conclusions

The EPA has considered the proposal by the proponent to clear 250 ha of native vegetation on Victoria Location 10641. During the course of this assessment, the proponent has indicated a willingness to reduce the area of vegetation proposed to be cleared to 215 ha, to retain vegetated corridors between areas of remnant vegetation on the property.

The EPA commends the proponent's willingness and initiative in modifying the proposal in order to reduce potential environmental impacts.

However, following careful evaluation of specialist botanical advice, the EPA considers that all the vegetation proposed to be cleared should be retained because of its conservation value, particularly its corridor value in providing a non-continuous link between a nature reserve and a national park, and contribution to species richness and endemism in the region.

Accordingly, the EPA's preferred position is that the vegetation proposed to be cleared be protected in a secure conservation reserve system. If this preferred outcome cannot be achieved, the EPA considers that some clearing could be permitted to proceed provided that an area of native vegetation is retained which includes the portions with identified high species richness, which provide adequate protection for priority species, and which maximises the benefit of a corridor between Lesueur National Park south of the property and South Eneabba Nature Reserve to the north. The area recommended to be retained is illustrated in Figure 5 of this report. The EPA is aware that the area recommended to be retained is greater than the area proposed to be retained by the proponent.

The EPA believes that this position would restrict the clearing of native vegetation to approximately 135 ha, as opposed to the modified area of 215 ha proposed to be cleared by the proponent.

6. Recommendations

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister considers the report on the relevant environmental factors of plant diversity and species richness, Declared Rare and Priority Flora, regional representation of vegetation, vegetation and fauna corridors (including contextual values), and viability of remnant vegetation on the property, as set out in Section 3 of this report.
2. That the Minister notes that the EPA considers that the vegetation proposed to be cleared should be retained because of the location of this vegetation in providing a non-continuous link between a national park and a nature reserve, and in particular its corridor value and contribution to species richness and endemism in the region.
3. That the Minister notes that the EPA's preferred position is that the land be protected in a secure conservation reserve system.
4. That the Minister notes that the EPA considers that if this preferred outcome cannot be achieved, the proposal could be permitted to proceed provided that an area of native vegetation is retained which includes the portions with identified high species richness,

which provides adequate protection for priority species, and which maximises the benefit of a corridor between Lesueur National Park south of the property and South Eneabba Nature Reserve to the north. The area to be retained is illustrated in Figure 5 of this report.

5. That the Minister notes that the EPA believes that this position would restrict the clearing of native vegetation to approximately 135 ha, as opposed to the modified area of 215 ha proposed to be cleared by the proponent.
6. That the Minister notes the concerns expressed by the proponent regarding assessment of his land clearing proposal presented in Appendix 5 of this report.
7. That the Minister notes that the EPA intends to provide advice, as early as possible, on actions which could be adopted by the Government to improve the assessment and processing of land clearing applications.

Table 1. Summary of assessment of relevant factors

KEY ENVIRONMENTAL FACTORS	OBJECTIVES	EVALUATION FRAMEWORK	EPA EVALUATION
1. Plant diversity and species richness.	<ul style="list-style-type: none"> to maintain adequate areas of high plant diversity and species richness. 	<p>Location 10641 is characterised by Kwongon Sandplain vegetation and is within an area of moderate richness of endemic species. Some specific areas within the location, on lateritic uplands and colluvial slopes, are likely to be very rich in endemic species</p> <p>Site specific data for the property indicates that priority species are present</p>	<p>The EPA concludes that in view of the species richness and endemism of the Kwongon vegetation in the region, of which this location is a part, it is appropriate from a biodiversity perspective to retain the vegetation.</p> <p>The EPA concludes in view of the presence of priority flora and species richness of the remaining flora, all vegetation proposed to be cleared should be retained.</p>
2. Declared Rare Flora and priority flora.	<ul style="list-style-type: none"> to protect DRF and priority flora consistent with the provisions of the Wildlife Conservation Act. 	<p>Vegetation on Location 10641 is typical of the Gardiner and Yerramullah North bioregions. This vegetation is not considered to be well represented within the conservation estate.</p>	<p>The EPA concludes that the portion of Location 10641 proposed to be cleared probably contains vegetation which is not well represented in the existing conservation estate, and that the vegetation should be retained and protected in a secure conservation reserve.</p>
3. Regional representation of vegetation proposed to be cleared.	<ul style="list-style-type: none"> to maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities. 	<p>Vegetation proposed to be cleared forms part of a non-contiguous vegetation corridor between Lesueur national park to the south, South Eneabba Nature Reserve to the north and Alexander Morrison National Park to the north-east.</p>	<p>The EPA considers that the retention of vegetation corridors to link national parks and nature reserves will add significantly to the environmental values of these areas in the region.</p>
4. Impact of vegetation clearing on corridors.	<ul style="list-style-type: none"> to maintain adequate vegetation corridors between substantial areas of remnant native vegetation. 	<p>Approximately 250 ha has been notified to clear, which is part of a large intact block of native vegetation of approximately 300 ha in area. This vegetation is considered to be in good condition. A total of approximately 423 ha (24%) would be retained.</p>	<p>The EPA considers that the remnant block of vegetation proposed to be cleared should be retained as an intact and undisturbed block because of its conservation value and corridor value, and contribution to species richness and endemism in the area.</p>
5. Viability of remnant vegetation.	<ul style="list-style-type: none"> to maintain the viability of remnant vegetation blocks. 		

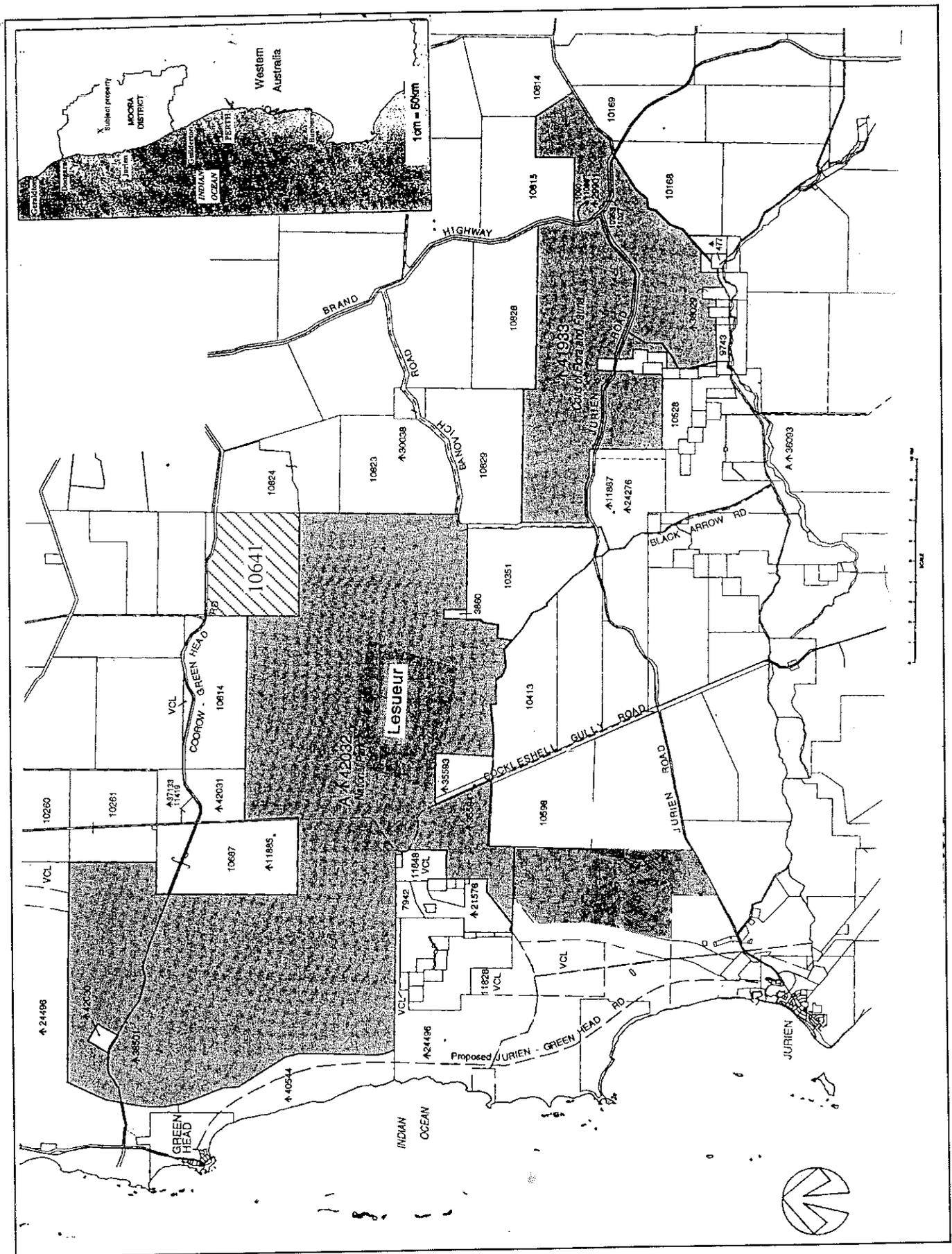


Figure 1. Location map of Martin property (Victoria Location 10641).

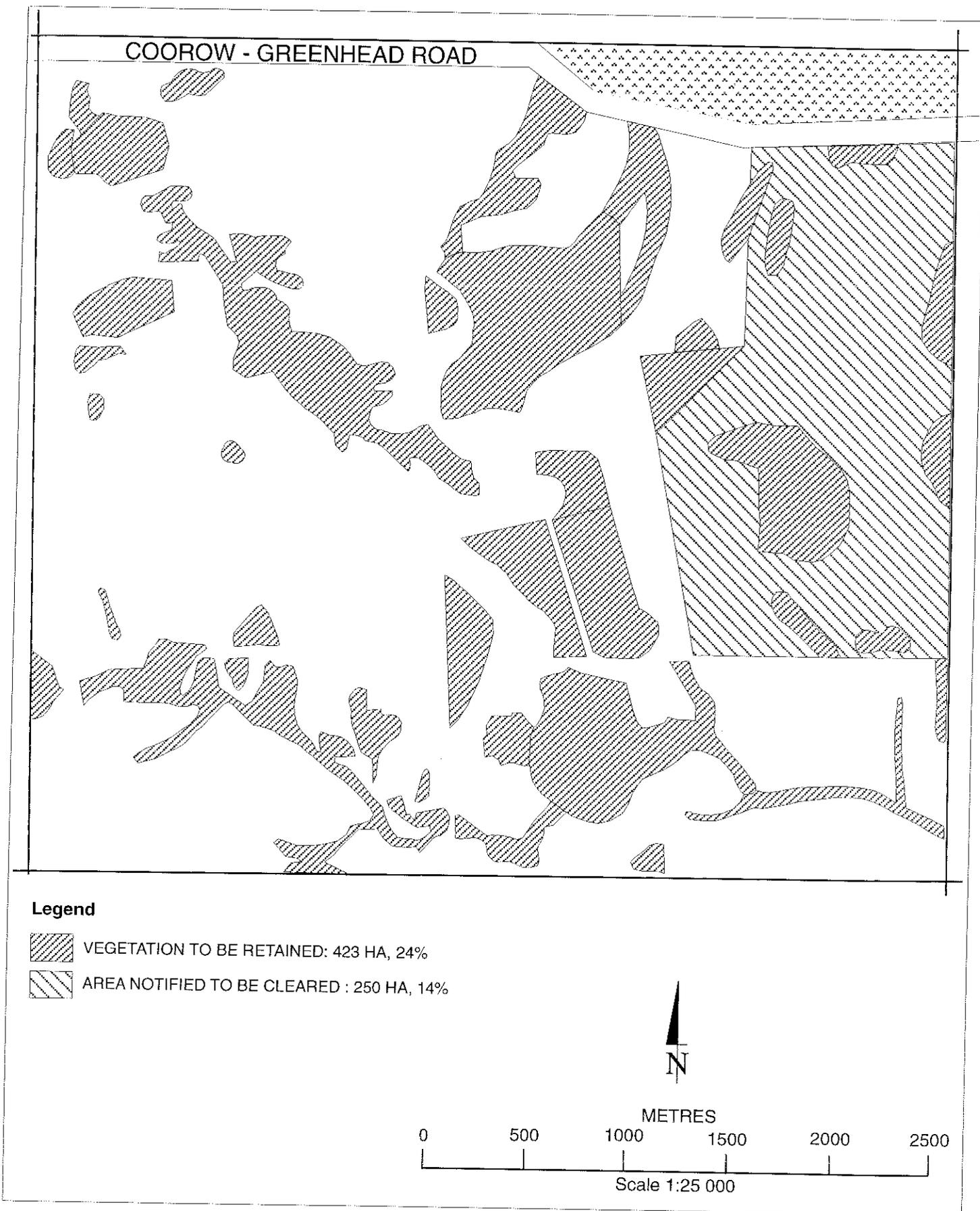


Figure 2. Area notified to be cleared (August, 1995).

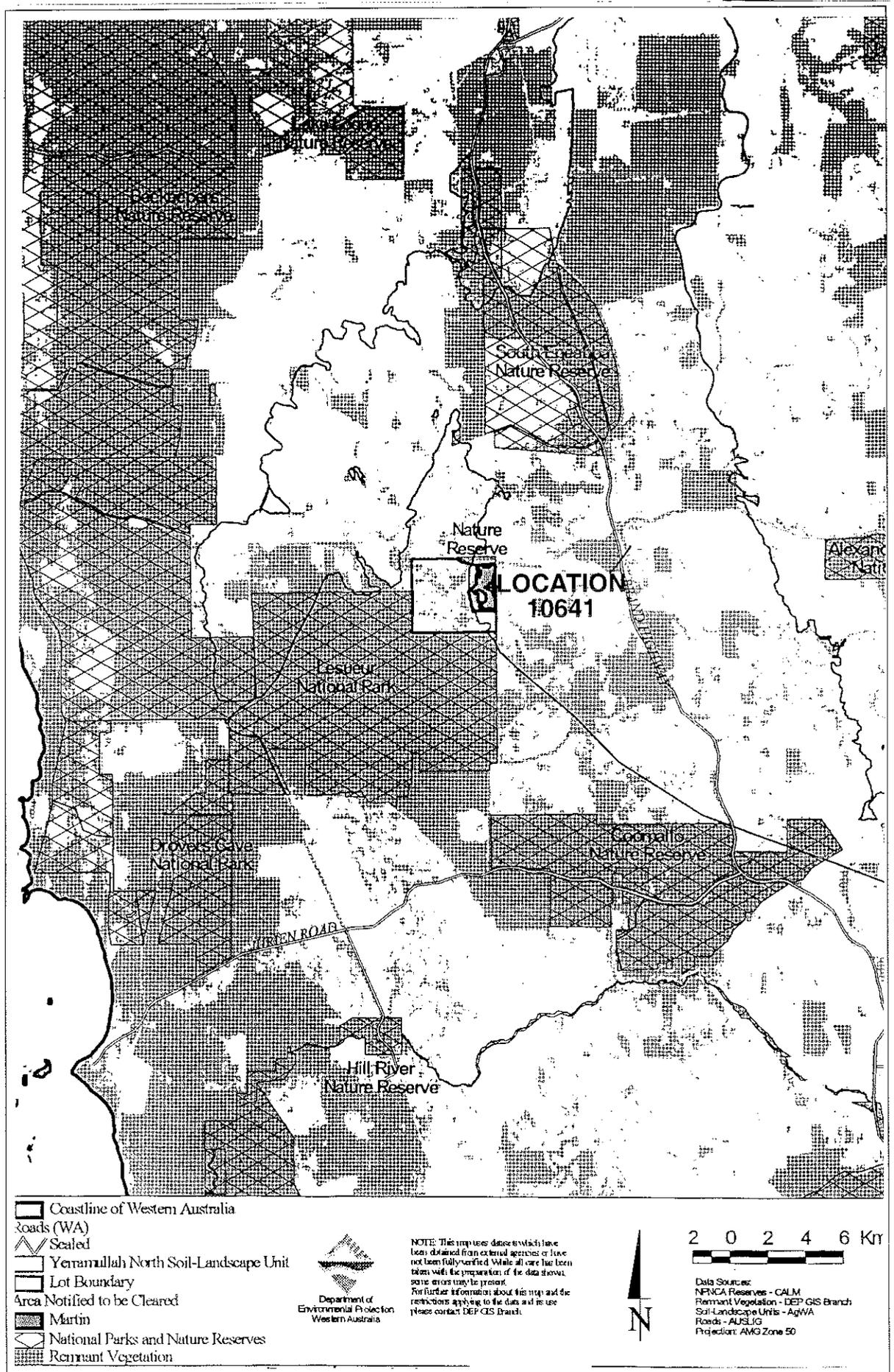


Figure 3. Location 10641 in relation to Nature Reserves and National Parks.

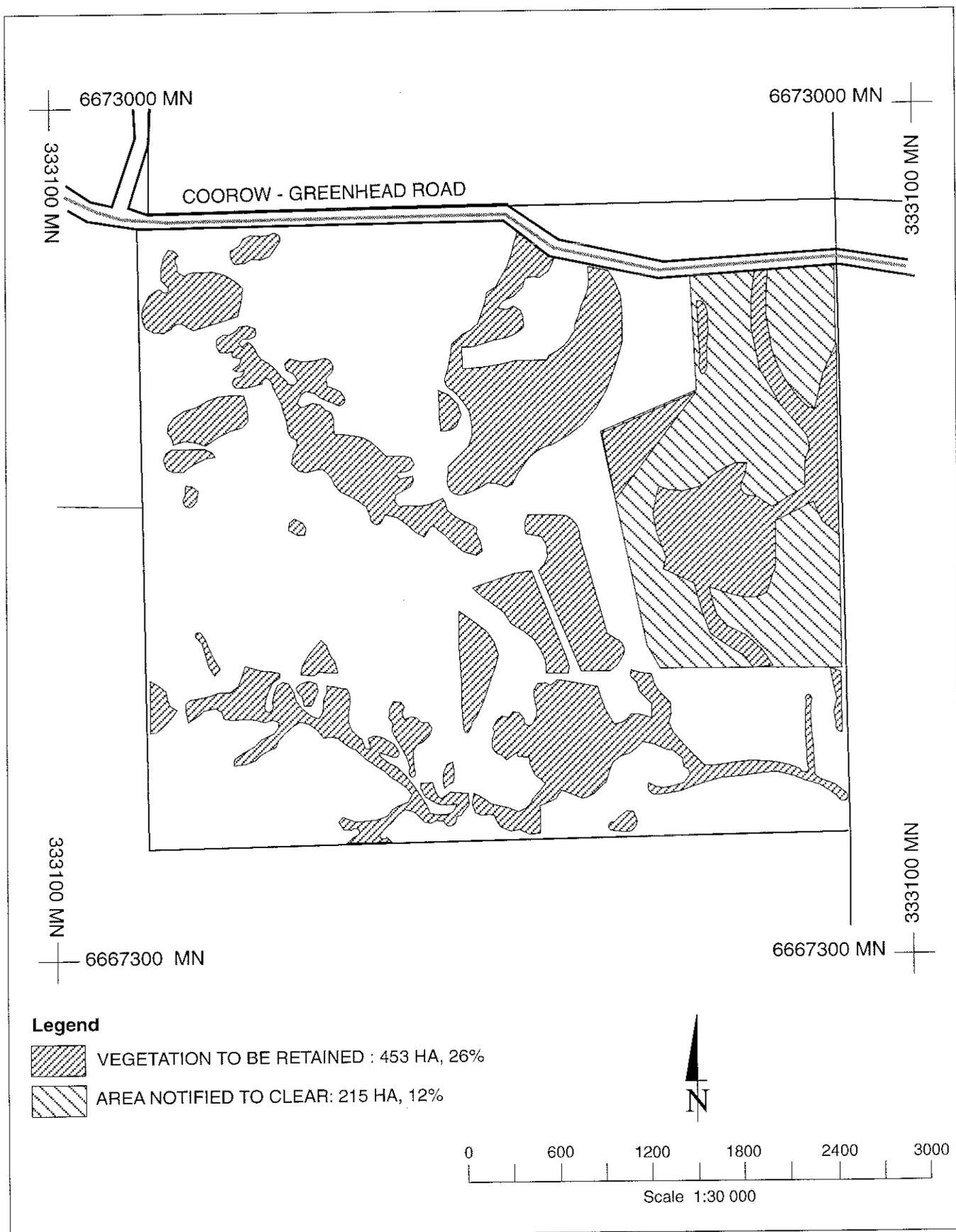


Figure 4. Map indicating modified land clearing proposal by proponent (September 1998).

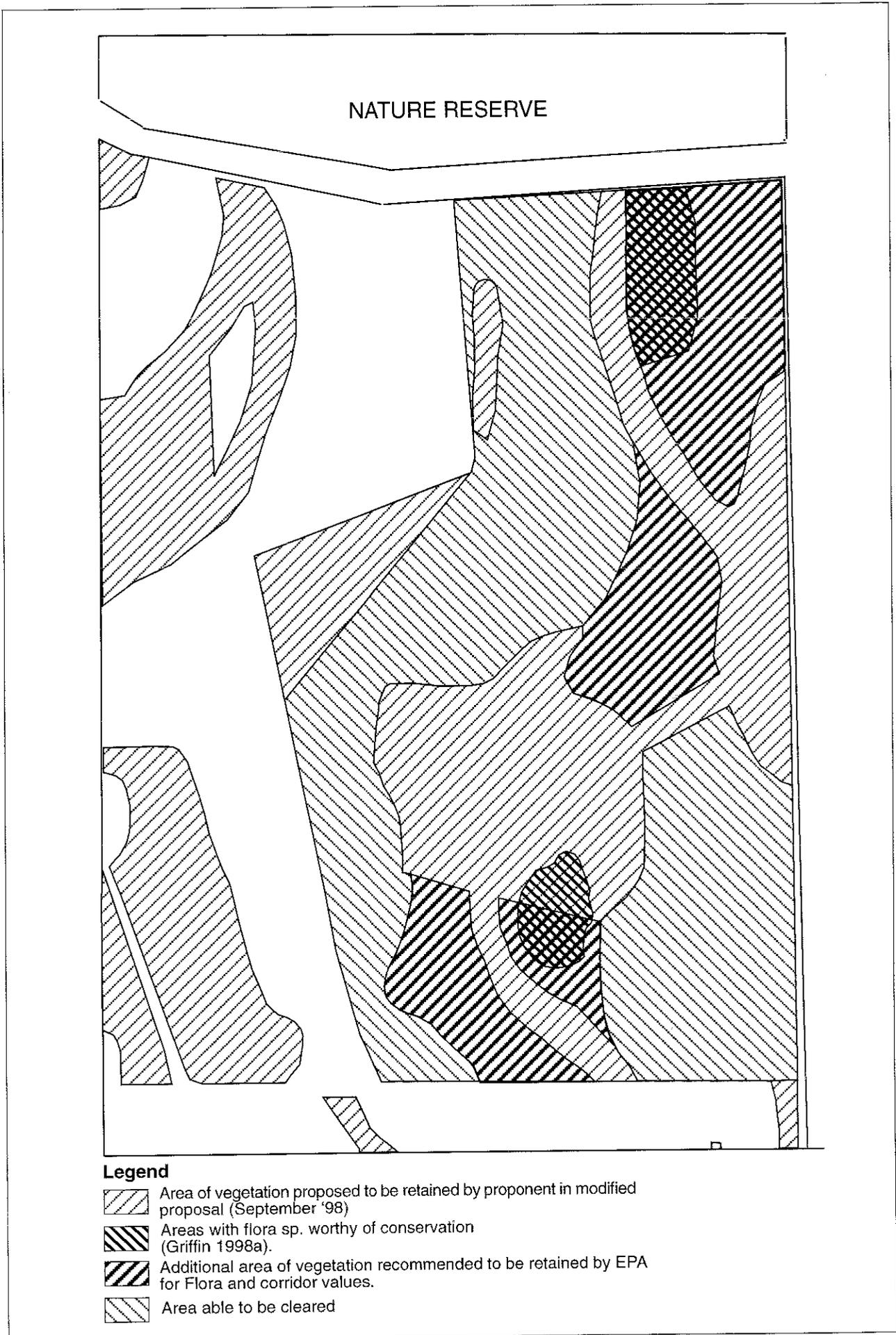


Figure 5. Map indicating area of vegetation which EPA considers should remain uncleared on Location 10641 if all the vegetation proposed to be cleared cannot be retained in a secure conservation area.

Appendix 1

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Appendix 2

**RARE AND PRIORITY FLORA SEARCH
ON VICTORIA LOCATION 10641**

Prepared by: Mattiske Consulting Pty Ltd

Prepared for: Department of Environmental Protection

November 1997

DEP001/44/97

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1. SUMMARY

A search for rare and priority flora species was undertaken in remnant vegetation on Victoria Location 10641 on 4th November 1997. The survey was commissioned by the Department of Environmental Protection as part of a clearing application by the owner, Mr Denis Martin.

During the survey no rare species which have been declared as Rare Flora, pursuant to subsection 2 of section 23F of the *Wildlife Conservation Act*, 1950 and as listed by the Department of Conservation and Land Management (1996) were located. Seven priority species were located at various locations in the remnant vegetation.

2. INTRODUCTION

In October 1997, Mattiske Consulting Pty Ltd was commissioned by the Department of Environmental Protection to carry out a search for rare and priority flora species on Victoria Location 10641, a private property in the Shire of Coorow. The owner, Mr Denis Martin, had lodged a Notice of Intent to clear native vegetation. As part of the approval process a search for rare and priority flora on the area proposed for clearing was required.

The survey area is located within the Bitter Pool Rises vegetation unit of the Arrowsmith Region which is characterized by gravelly yellow duplex soils on low hills and rises (Griffin and Burbidge 1990). The area is located within 2km of the northern boundary of Lesueur National Park, an area which is recognized as having high botanical diversity and a high occurrence of rare flora. The landform which is proposed for clearing is only one of several identified in the National Park. The vegetation associations recorded during the survey included woodlands and heaths on sandy and lateritic soils.

A species list of rare and priority flora was provided by the Department of Environmental Protection. This list was extracted from the database managed by the Department of Conservation and Land Management (1996). This list included 116 rare and priority species which potentially could occur within the wider area. Griffin *et al.* (1990) identified 65 species of rare or priority flora occurring in the Lesueur area and noted that many are of extremely limited geographical range. One species (*Grevillea batrachioides*) is known from only one small population within the National Park. The list of species supplied covered a wide range of landform units and vegetation associations and therefore only a few would be expected within the specific survey area.

3. OBJECTIVES

The objective was to undertake a survey of Victoria Location 10641 for rare and priority flora utilizing information on the landform units and vegetation associations found in Lesueur National Park.

4. METHODS

A species list of rare and priority flora was provided by the Department of Environmental Protection. This list was extracted from the database managed by the Department of Conservation and Land Management (1996). By referring to the soil and landform mapping units and vegetation associations identified for Lesueur National Park, it was concluded that the most likely landforms to contain rare and priority species would be those with sandy and lateritic soils.

Prior to undertaking the field survey, the botanists visited the WA Herbarium to view specimens of the rare and priority species.

On arrival at the survey site a meeting was held with the proponent, Mr Martin, to determine the areas proposed for clearing and retention. A preliminary circuit of the area was conducted by vehicle to ascertain the vegetation associations and soil and landform units which occurred at the site. The heaths on sandy and lateritic soils and the woodlands were comparable with the vegetation associations of the Bitter Pool Rises landform unit found in the Lesueur National Park.

As the assessment of the relationships between the vegetation and the landforms indicated that the rare and priority flora would most likely occur in the heaths on the sandy and lateritic soils, a search on foot was conducted along the junction between the laterite and sandy soils around the main topographical feature, a lateritic hill in the centre of the remnant vegetation. Further transects were made in other soil and landform types and vegetation associations, both in areas which were proposed to be retained and areas proposed to be cleared.

5. RESULTS

All significant vegetation associations observed in the survey area were traversed on foot to determine the presence of potential rare and priority flora. No species of Declared Rare Flora or Priority 1 species were located within the survey area, but seven species of other Priority Flora categories were located (Table 1). No attempt was made to map the boundaries of the populations due to the brief nature of the survey.

Table 1 : Priority Species located in Remnant Vegetation on Victoria Location 10641

Conservation Status	Species
Priority 2	<i>Stylidium diuroides</i> ssp. <i>paucifoliatum</i>
Priority 3	<i>Daviesia epiphyllum</i> <i>Hakea spathulata</i>
Priority 4	<i>Banksia chamaephyton</i> <i>Darwinia sanguinea</i> <i>Dryandra sclerophylla</i> <i>Hakea neurophylla</i>

Some of the annual species, including orchids, were not located due to the timing of the survey. For some of these species to be observed, a survey would need to be conducted earlier in spring.

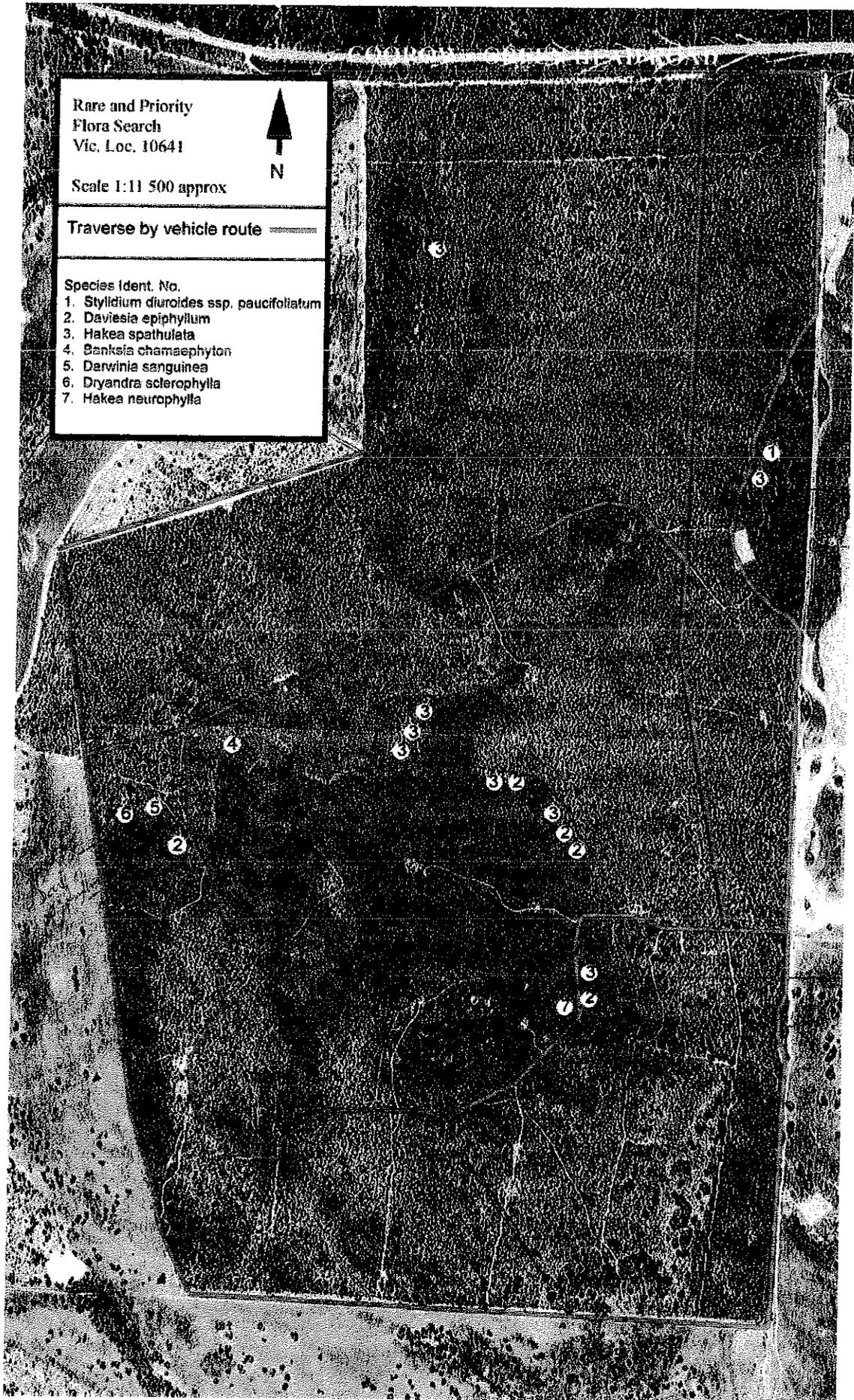


Figure 1 : Air photo showing vehicle traverse and approximate locations of priority flora located during survey

6. DISCUSSION

The dominant landform features of the survey area are the lateritic rise in the centre of the property and the gently undulating sandy slopes located downslope from the lateritic rise. A total of 116 rare and priority flora species were known to potentially occur within the wider area near Victoria Location 10641. The geographical range of the species on this list was considerably larger than the survey area. The list of potential rare and priority species (Department of Conservation and Land Management 1996) also included 3 declared rare flora which are known to occur on lateritic soils (*Hakea megalosperma*, *Eucalyptus lateritica* and *Eucalyptus suberea*). These species are quite large in habit and would have been visible in the low heath. In view of the potential for these rare flora, the search was centred on the interzone between lateritic heath and the sandy soils downslope as it is up to this zone that Mr Martin proposes to clear. After a search of this interzone, other areas were searched in order to cover all vegetation types believed to occur in the remnant vegetation. ^{Several of the} No priority species were located in any areas which were proposed for clearing according to the plan supplied at the time of the survey.

The vegetation on the Bitter Pool Rises has similar structural formations to the vegetation on the Gairdner Dissected Uplands but with recognizably different floristic compositions (Griffin & Burbidge, 1990). The high species richness and density of rare flora reported in the area are attributed to the wide variety of habitats provided by the varied geological substrates and the topographical relief of the dissected landscape between the Warradarge and Lesueur faults. The dissection occurs between the Gairdner Dissected uplands, Banovich Uplands and the Bitter Pool Rises landforms and is not evident within the Bitter Pool Rises landform unit. The latter may account for the lack of Rare and Priority 1 flora located in the survey area.

As the survey was undertaken in late spring, some annual species were not recorded during the survey. For these species to be adequately assessed, a survey would need to be carried out earlier in spring.

7. LIST OF PARTICIPANTS

Principle Ecologist	:	Dr Libby Mattiske
Principle Botanist	:	Dr Eleanor Bennett
Biologist	:	Mr Bill Evans

8. ACKNOWLEDGMENTS

Mattiske Consulting Pty Ltd would like to thank Mr Ben Carr of the Department of Environmental Protection for assistance with survey data and logistical support during the survey.

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Appendix 3

Interim Bioregions West Midlands

prepared for
Department of Environmental Protection

by
AGWEST Land Management

E. A. Griffin

July 7, 1998

to be quoted as

E.A. Griffin (1998) Interim Bioregions West Midlands. Unpublished report for Department of Environment Protection. AGWEST Land Management Job 98/155.

Introduction

This document is an interim attempt to define floristic bioregions in the West Midlands area. The assessment is necessary because the high floristic diversity in this area means that there is a need for more certainty in the definition bioregions. To date it has been Beard's (e.g. Beard 1976, 1979) vegetation types which have been used for regional analysis.

Griffin (1990, 1992, 1993 and 1994) demonstrated that Beard's vegetation types were unsatisfactory in describing many of the floristic patterns identified in those studies. In each of these three studies alternate bioregions were proposed. However, the limited geographic coverage of these studies has meant that the recommendations have not been utilised in such as IBRA boundaries.

In this study, an attempt is made to identify surrogate spatial data which can be used to extrapolate the floristic assessments of Griffin. Many of the boundaries identified by Griffin were geological or geomorphic in character. However, most Quaternary surface geology units (e.g. Lowry ???) were too generic to be useful, even though the mapping was reasonably detailed. The geomorphology units (Baxter 1977) was at too coarse a scale to be useful.

The soil-landscape mapping being prepared by Agriculture WA is at a detailed scale and has a hierarchy of map units which are analogs of Beard's systems, districts and provinces.

The method of correlation at this stage has been limited, however, it is expected that the relationship is strong enough for the essence to be clear in this study.

Study Area

The West Midlands area has been defined in a number of ways going back almost 100 years. Essentially it is the portion of the Perth Sedimentary Basin between the Moore and Irwin Rivers. This is roughly the area which Speck (1958) recognised as the Lesueur Botanical District. Most of the endemic species typical of this area are wholly contained within this area (Griffin 1981).

The Darling Fault has been recognised as a sound basis for separating geomorphic and bioregions. The greatest uncertainty appears to be any natural subdivision of the Swan Coastal Plain and subdivisions of the Dandaragan Plateau.

Why associate floristic patterns with soil-landscape patterns?

"It is concluded that geological substrate, as modified by soil development and stripping patterns, is fundamental to the variation in composition of the vegetation supported." (Griffin 1994, p ...).

Griffin (1990) in recognising floristic regions noted that the regions could be "... readily recognised on aerial photographs."

Soil-landscape mapping involves more than mapping of soil types. It is mapping landscapes with a particular combinations of soil types. It takes information such as geology and geomorphology into consideration. It is also hierarchical and the soil-landscape system is close to the landscape catena concept as outlined by Beard (1969):

“A Vegetation System consists of a particular series of plant communities recurring in a catenary sequence an mosaic pattern linked to topographic, pedogenic and/or geological features.”

The recent soil-landscape mapping in the south-west of Australia is nearing completion. It is based on stereo interpretation of aerial photographs flown at the equivalent of the scale of 1:20,000 to 1:50,000. This mapping has several advantages over Beard's mapping. Firstly, much of Beard's mapping in the west midlands used a photomosaic but no aerial photo interpretation. It also relies on mental reconstruction of a fragmented vegetation coverage. In contrast, the soil-landscapes are relatively unaltered by agricultural clearing and can be readily interpreted from aerial photographs. Also, the soil-landscape mapping programme has had much greater resources including field verification than had the mapping which Beard did. The methods of capturing the mapping in a digital form has produced a more accurate product than was possible in Beard's time.

Floristic Patterns

Griffin (1994) identified a number of common geographic boundaries which described a significant portion of the floristic distribution in the present study area. The major ones also corresponded with some of the boundaries of Beard's units and soil-landscape system boundaries.

A visual correspondence between the scatter plots generated by Griffin (1994, Figure 10) and the soil-landscape system boundaries (Grose in prep, Schoknecht in prep, Griffin in prep) was undertaken. (An objectively based method would have been more appropriate but was beyond the time currently available.) Never-the-less the subjective assessment has produced a number clear associations. The bioregions described here are those which are most relevant to the current round of assessment of land clearing applications. Further descriptions will be prepared as required.

Figure 1 indicates interim bioregions based on soil-landscape boundaries and subdivisions based on floristic patterns. This shows that the coastal dunes are distinct bioregions. Inland areas are mainly related to differences in Mesozoic sediments and the degree of landscape stripping. There were some subdivisions made solely on the basis of floristic patterns.

Bioregion Descriptions

The Quindalup bioregion include a number of floristic groups which are quite confined to these recent calcareous dunes (Fig 9o - 9t). Griffin (1993) identified further regional divisions.

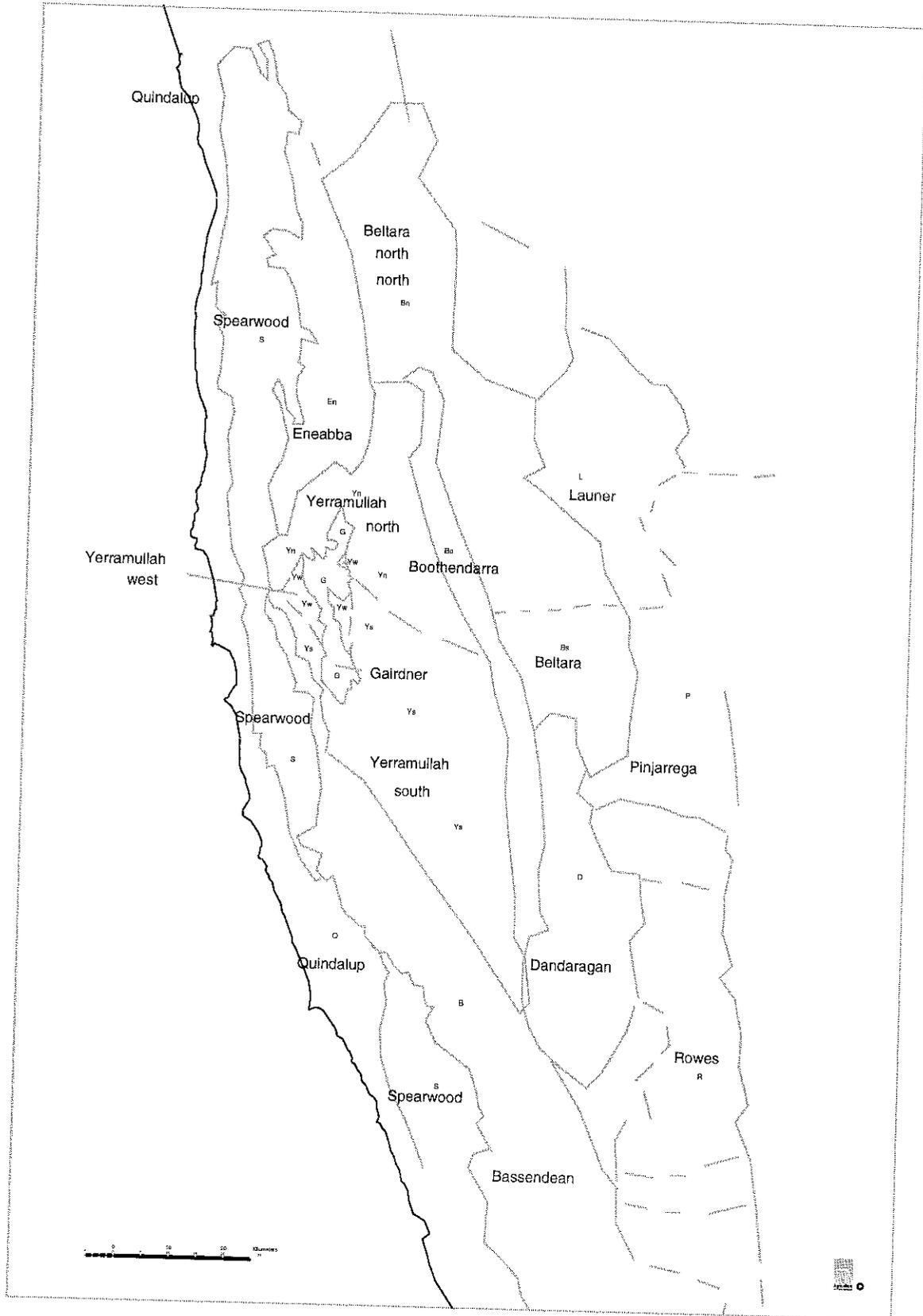
The Spearwood bioregion (Spearwood and the Tamala systems) include closely related floristic groups (Fig 10g). It is probable that these might be further sub-divided.

The Bassendean bioregion included a number of floristic groups. It is clear that it could be subdivided. (Griffin and Keighery 1989).

The Eneabba bioregion is the Eneabba system. This has been defined on an interim basis as it has similarities with part of the Yerramullah bioregion and undefined ones in the north.

The Gairdner bioregion is essentially the Mintaga Hills and the Lesueur soil-landscape systems. Potentially this could be amalgamated with the western portion of the Yerramullah bioregion. This might be reconciled with more detailed investigations of these data sets. It corresponds with much of the Cockleshell Gully Formation where it has not been covered by the coastal dunes.

Figure 1 Interim Bioregions West Midlands



The Yerramullah bioregion includes the Yerramullah and Nylagada soil-landscape systems and covers a significant portion of the Arrowsmith Region (a geomorphic unit, Baxter, 1977). It is also the majority of the Yarragadee Formation south of Eneabba where it has not been covered by the coastal plains. This bioregion is typical of the Badgingarra sandplain and ranges from Cataby to Eneabba. It was called the Badgingarra Floristic Region by Griffin (1990). On the basis of the floristic analysis, several clear divisions were possible; a small western, a northern and a southern portion. As mentioned earlier, the western portion might best be incorporated with the Gairdner bioregion. The eastern boundary between this and the southern portion is the Warradagee Fault which separates distinct geological formations. The boundary between the southern and northern portion was difficult to define due to limited data. It has been set at between the north-east corner of the Lesueur National Park and the eastern boundary of the Coomallo Nature Reserve.

The Boothendarra bioregion is equal to the Boothendarra soil-landscape system and corresponds to the Otorowiri member of the Yarragadee Formation and the Carnac member of the Parmelia Formation south of the Eneabba-Carnamah Road. It was called the Otorowiri Floristic Region by Griffin (1990). This region has a wide range of soils and many different vegetation types, most of which are documented poorly.

The Beltara bioregion is a major portion of the western half of the Parmelia Formation and lies on the Dandaragan Plateau (Baxter 1977). It was called Boothendarra Floristic Region by Griffin (1990). It has similar topography to the Yerramullah bioregion. However, its less dissected eastern portions are relatively intact plateau surfaces. It shares some floristic groups with the Yerramullah bioregion. Two divisions were recognised within Beltara. The Big Soak Plain appears to be a significant boundary and an interim line has been set to correspond with the southern boundary of the residual upland of Big Soak Plain. This might be an artifact of the low sampling effort along the Dandaragan Scarp (the western boundary of the Dandaragan Plateau) north of Big Soak Plain. The floristic composition of vegetation on the northern portion appears to intergrade with those on the northern portion of the Yerramullah bioregion.

The Launer bioregion is tentatively defined and is the sandplain west of Yarra Yarra lake.

The Pinjarrega bioregion is the alluvial plain and sand sheets associated with the ancient drainage line discharging southward from Yarra Yarra lakes.

The Dandaragan bioregion is the moderately stripped portion of the Cretaceous Lancelin Formation (and its various sub units) and corresponds roughly to the distribution of marri in the Dandaragan area.

The Rowes bioregion is an interim combination of the Rowes and Capitella soil-landscape systems. It is the less stripped areas of the Lancelin Formation between Moora and Dandaragan. Griffin (1990) implied that the Watheroo National Park would be part of this bioregion. But, this appears to not be the case.

Conservation status of bioregions

The area of uncleared vegetation was obtained from an unpublished spatial data set generated from satellite imagery from 1995 (Wallace et al in prep.). The proportions uncleared and that in NPNCA reserves is summarised in Table 1.

The Quindalup bioregion is well conserved in this study area with some local deficiencies and threats.

The Spearwood bioregion is also well represented in this study area, though the southern portion is less well represented.

The Bassendean bioregion has much uncleared (mainly Crown) land but is poorly represented in the conservation estate and has significant threats from mineral sands mining.

Table 1 Area analysis of proportion of bioregion and soil-landscape system vegetated and in conservation reserves

Interim Bioregion	Soil-landscape system	proportion Vegetated	proportion NPNCA
Quindalup	Quindalup	0.76	0.46
	Eatha	0.64	0.89
Spearwood	Spearwood	0.64	0.16
	Tamala	0.92	0.66
Bassendean	Bassendean	0.70	0.09
Eneabba	Eneabba	0.40	0.18
Gairdner	Mintaga Hills	0.31	0.16
	Mount Lesueur	1.00	0.80
Yerramullah	Yerramullah	0.38	0.17
	Nylagarda	0.27	0.10
	western	0.76	0.60
	southern	0.38	0.20
Boothendara	Boothendara	0.37	0.12
	Boothendara	0.09	0.02
Beltara	Beltara	0.43	0.12
	northern	0.43	0.10
	southern	0.41	0.15
Launer	Launer	0.28	0.07
Pinjarrega	Pinjarrega	0.66	0.53
Dandaragan	Dandaragan	0.09	0.00
Rowes	Rowes	0.10	0.00
	Capitella	0.19	0.01
	Moore River	0.60	0.03

proportion vegetated

proportion of soil-landscape system which has native vegetation.

proportion NPNCA

proportion of soil-landscape system which is in NPNCA estate.

The Eneabba bioregion also has much uncleared Crown land but there are local deficiencies and significant threats from mineral sands mining.

The Gairdner bioregion (Mt Lesueur and Mintaga Hills soil-landscape systems) is well represented in the Lesueur National Park which includes at least 1/3 of its original extent. The Mintaga Hills soil-landscape system is less well represented than the Mt Lesueur.

The Yerramullah bioregion is moderately well represented in the Badgingarra and Lesueur National Parks and the Coomallo and South Eneabba Nature Reserves. These represent about 17% of its original extent. The sub-regions within the Yerramullah bioregion varied in their representation. The northern portion of Yerramullah is least well represented having only the South Eneabba Nature Reserve. There are several unvested Crown reserves which if included would increase the representation.

The Boothendarra bioregion is very poorly represented with only a small portion uncleared let-alone in the conservation estate; the western portion of the Alexander Morrison National Park.

The Beltara bioregion is moderately well represented in the conservation estate. The northern portion is represented by the Watto Nature Reserve, and the Tathra and Alexander Morrison National Parks. The southern portion is less well represented by the Boothendarra Nature Reserve and a part of the Watheroo National Park. In addition there is a big area of Vacant Crown Land in the northern portion (Big Soak Plain). However, this includes areas not well represented in the conservation estate, the residual upland, and only some of the land cleared for agriculture.

The Launer bioregion is poorly represented in the conservation estate. There are a few small Crown reserves in the area and some areas of uncleared private land.

The Pinjarrega bioregion is very well represented by the Watheroo National Park and Pinjarrega Nature Reserve. A minority of the vegetation types are poorly represented.

The Dandaragan bioregion is very poorly represented with just one small conservation reserve (Jam Hill Nature Reserve). There is very little of this bioregion left uncleared.

The Rowes bioregion (Rowes and Capitella soil-landscape systems) is poorly represented with only part of Jam Hill Nature Reserve and the small Bundarra Nature Reserve. Much of the area has been cleared but there are some uncleared parts of significance in private ownership.

Acknowledgments

The use of the vegetation cover data is gratefully acknowledged. Mike Fuller of the Department of Environmental Protection prepared the analysis from which the data in Table 1 generated. Ben Carr and Charlie Nicholson of the Department of Environmental Protection provided useful advice from their experience with analyzing the conservation status of Beard's vegetation units.

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Appendix 4

A brief review
of the Nature Conservation values
of remnant on Victoria Location 10641

prepared for
Department of Environmental Protection

by
AGWEST Land Management

E. A. Griffin

25 September 1998

to be quoted as

Griffin, E.A. (1998) A brief review of Nature Conservation values of remnant on Victoria Location 10641. Unpublished report for Department of Environment Protection. AGWEST Land Management Job 98/155.

Summary

The following report provides additional information about the nature conservation values of the remnant on Mr Martin's property which is the subject of a Notice of Intent to Clear. It is noted that the preferred position of the Environmental Protection Authority is that the whole of the remnant should remain uncleared. That position is supported, especially for the aspect of long term viability of the values contained in the remnant.

The information in this report is an attempt to define the portions of the remnant which should have a priority for protection should some clearing be negotiated. In addition, a continuous corridor scenario is presented. This combines these priority portions with the areas which would remain uncleared under Mr Martin's proposal.

Introduction

The property was visited on 2nd September, 1998 for about 3 hours. This visit was to clarify Mr Martin's proposal and to obtain additional information on the conservation significance of the remnant.

Access was gained by driving along the main tracks through the remnant at question. A number of stops were made to inspect vegetation and or plants which sparked interest. The property owner, Mr Martin, clarified the boundary of areas he wished to clear. These were recorded on an aerial photograph which has been digitized and presented in Figure 1. He explained that there were three types of land which he did not wish to clear; too rocky (lateritic uplands), too steep with high erosion risk (breakaway and colluvial gravel slopes) and poor deep sand (wash areas with Banksia species). To him the remainder of the area was potentially highly productive.

Figure 1 shows that under Mr Martin's proposal one sizable remnant would remain; the laterite upland and its colluvial gravelly slopes. A narrow strip is subtended to the south. A smaller upland on the east boundary would also be left. Two narrow strips of deep sand are to be connected to this patch to the north and south. One of the isolated patches on the west boundary is sandy, the other rocky.

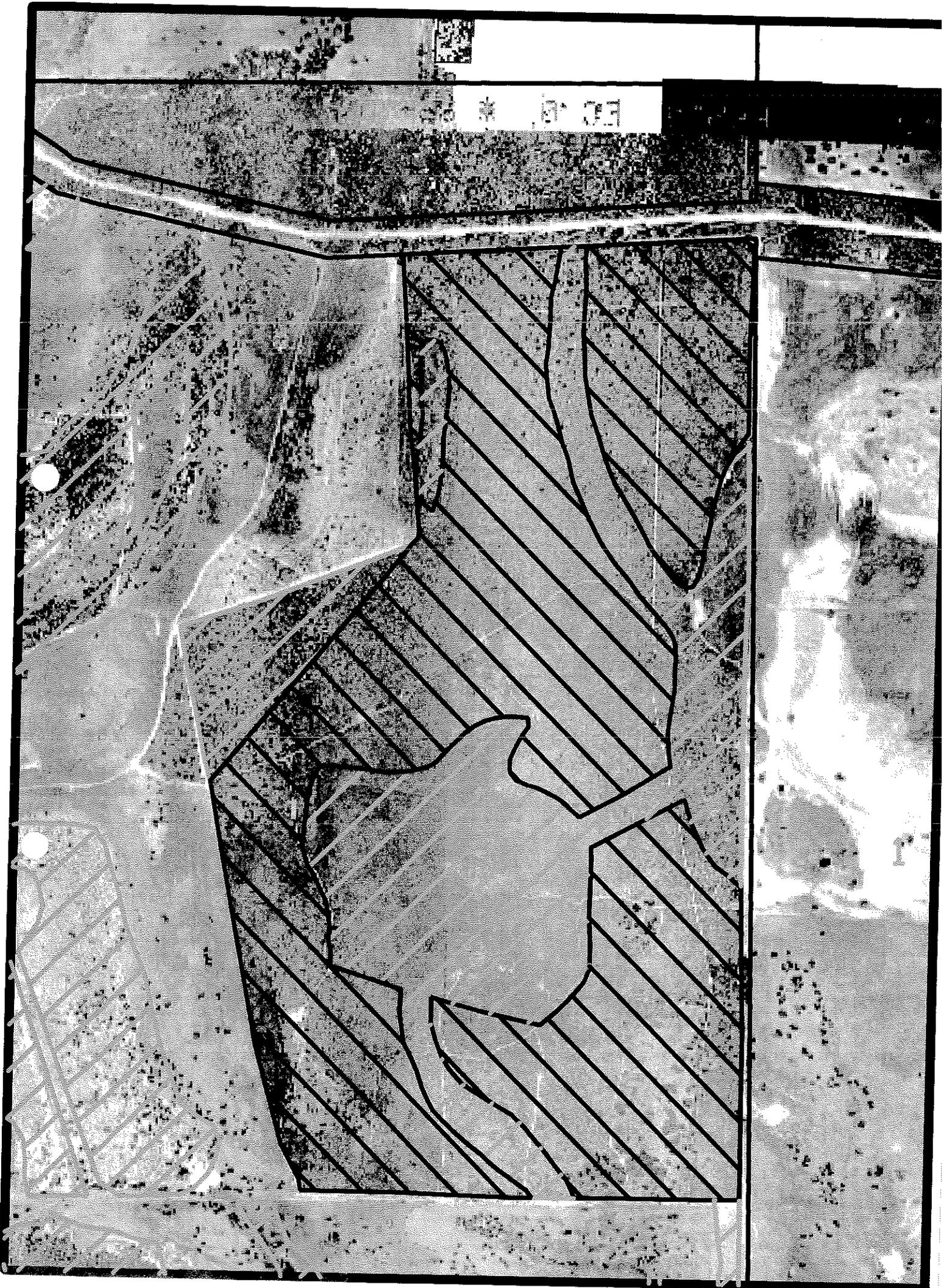


FIGURE 1

Description of remnant

The inspection has supported the earlier assessment that the remnant contains vegetation which is typical of the Gairdner and Yerramullah North bioregions (Griffin 1998). There is clear evidence that there is an overlap of species distributions on the property. No vegetation or species was noted which was not known or believed to occur in conservation reserves in the region.

The upland areas are typical of Yerramullah with *Dryandra carlinoides* and *D. glauca*. There are a number of species which are typically of Yerramullah (north), especially *Eucalyptus tetragona* and *Xylomelum angustifolium*. These are growing on the colluvial slopes.

These slopes are a fine scale mosaic of vegetation patterns with affinities with Yerramullah (north) and Gairdner. These patterns are strongly influenced by the colluviation and the solid geology (predominantly the Cockleshell Gully Formation, both Catamarra and Eneabba Members). (The Warradagee Fault is east of, or nearly coincident with, the eastern boundary of the property.)

A small patch of heavier soil in the south-east corner of the remnant is typical of the vegetation in the north-east corner of the Lesueur National Park which has developed on the weathered fine grain sediments within the Eneabba Member. The steeper part of the southern facing slope of the upland in the center of the remnant is an area where the colluvial gravel has been partially stripped. This has left a veneer of colluvium over weathered sandstone, probably within the Catamarra member. This has biggest population of *Hakea neurophylla* on the remnant. Such areas are mainly restricted to the Lesueur National Park where they occur as isolated patches. Other vegetation patterns, eg the linear bands of tree mallee form of *Eucalyptus calophylla* is typical of areas in the eastern part of Lesueur National Park with moderately deep sand over fine texture Catamarra sediments. There are also deep weathered colluvial sandy slopes with vegetation apparently typical of Yerramullah (north). These are slopes from the western and northern sides of the main upland in the remnant.

Priority flora

This visit was not expected to document the occurrence of priority species. However, two were noted; *Hakea neurophylla* and *Daviesia epiphylla*. These were in or adjacent to the colluvial slopes inspected by Mattiski and associates. The *Hakea* was a significant population not previously reported by Mattiski and associates. The *Daviesia* was from where they had noted it. In addition to these species, a population of mallees was found on the south face with *Hakea neurophylla*. This might be one of several rare ones from Lesueur but there were no fruit, buds or flowers to identify them by.

The lateritic uplands and the colluvial slopes are the most likely part of the remnant where rare and priority species could be found. Other areas on the remnant have a low probability of occurrence of these species.

Priority portions of remnant

The central lateritic upland with its colluvial gravelly slopes appear to be the area with the highest concentration of plant species or habitats which individually merit protection. Figure 1 includes most of this (including the colluvial gravelly slopes) within an area to be retained as uncleared. This is commended.

Several other areas were identified as being significant and warrant consideration for protection.

The first is an apparently large population of *Hakea neurophylla* (the larger of the two red polygons at the bottom of Figure 2). This population is significant as it is one of the northern most and merits protection to help maintain genetic diversity of this very restricted an endemic of the Lesueur area. Perhaps more significant is that the habit in which this *Hakea* grows, typically has a number of other rare or priority species. The unidentified mallee may be one of these. Half of this patch would be lost if the proposed clearing proceeds.

The smaller red polygon at the bottom of Figure 2 is a population of *Xylomelum angustifolium*. This is considered unusual in the Lesueur area, being typical of areas to the north and east. The only plant previously recorded near to the Lesueur National Park was at the corner of the Cockleshell Gully and the Coorow Green Head Roads and is vulnerable because it is in a road reserve. Mr Martin believes he has seen some in the Lesueur National Park but these have not been seen during extensive surveys in the 1980s. All of this patch would be lost if the proposed clearing proceeds. One of the significances of such occurrences is that if they represent a valuable resource which can help in the understanding of the dispersal of species in south-western Australia. In the same regard, the occurrences of *Eucalyptus tetragona* could be included in areas warranting protection. The isolated few plants were within the area proposed to be cleared, just north of the large upland.

A third polygon is marked at the northern end of the remnant. This represents an area of mallee form of *Eucalyptus calophylla*. This in itself is not unusual in the Lesueur area, however, it would have a high value for avian fauna because of its position adjacent to the Coorow Green Head Road. This is significantly placed to be a "staging area" for movement toward Lesueur. All of this patch would be lost if the proposed clearing proceeds. A similar area occurs in the south west corner of the remnant. It is considered that this has lower strategic significance than the one highlighted.

Viability

The whole of the remnant under consideration has a very good chance of remaining in tact for a long time. Being adjacent to a small reserve on the north side of the Coorow Green Head Road adds greatly to the viability of the combined unit.

The largest portion which Mr Martin proposed to retain (600 – 700 m diameter) has a reasonable chance of surviving in good condition for a long time. This is because of its size, its shape (low perimeter to area ratio), its elevated position and the inherent moderate resilience of lateritic upland vegetation. The other portions are much smaller and narrower. The deep sandy areas are typically about 100 m wide. Such areas have a low potential to survive unchanged for more than a decade or so. They are not only narrow but they also occur in a low part of the landscape which compounds the "edge effect", by being a sump.

Nature Reserve

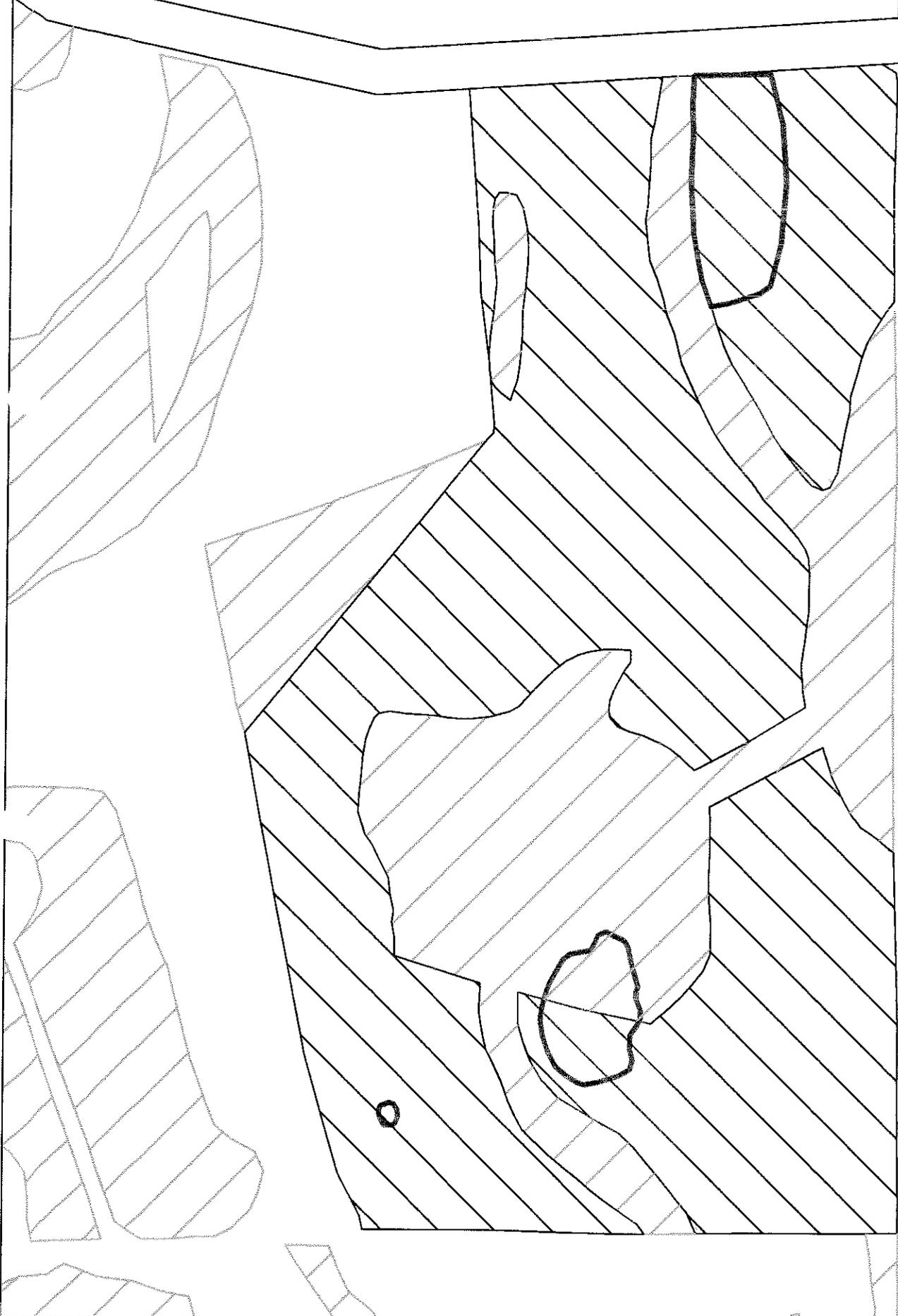


FIGURE 2

No definitive “minimum” width for a viable remnant has been established for the vegetation in this area. However, anything less than 3 or 4 hundred meters wide would be seriously vulnerable (Dr Richard Hobbs, CSIRO pers comm.). Therefore the narrow strips which Mr Martin proposes to leave, must be much wider if they are to remain for very long in near a natural state. The areas of lateritic upland on the eastern boundary would be of marginal viability.

A significant issue for viability is its fire management. The typical management of native vegetation in the West Midlands includes mineral earth breaks in combination with low fuel buffers and occasionally strategically located low fuel blocks. Narrow strips are particularly vulnerable to the unintended consequence of protective fire management.

Corridor

The EPA considered the whole remnant as a viable corridor bridging most of the gap between the east-west corridor along the Coorow-Green Head Road and the Lesueur National Park. An issue which is difficult to resolve categorically is just how narrow can a corridor be before its corridor values become devalued. Also must the corridor be continuous or are “stepping stones” be just as good. The overall viability of corridor needs to be integrated in this question.

A continuous corridor with a minimum width of 500 m has been adopted as a starting point to generate a scenario for discussion. This has been depicted in Figure 3 as blue hatching. This includes the three areas mentioned above which, of themselves, merit protection.

Reference:

Griffin, E.A. (1998) Interim Bioregions West Midlands. Unpublished report for Department of Environment Protection. AGWEST Land Management Job 98/155.

Nature Reserve

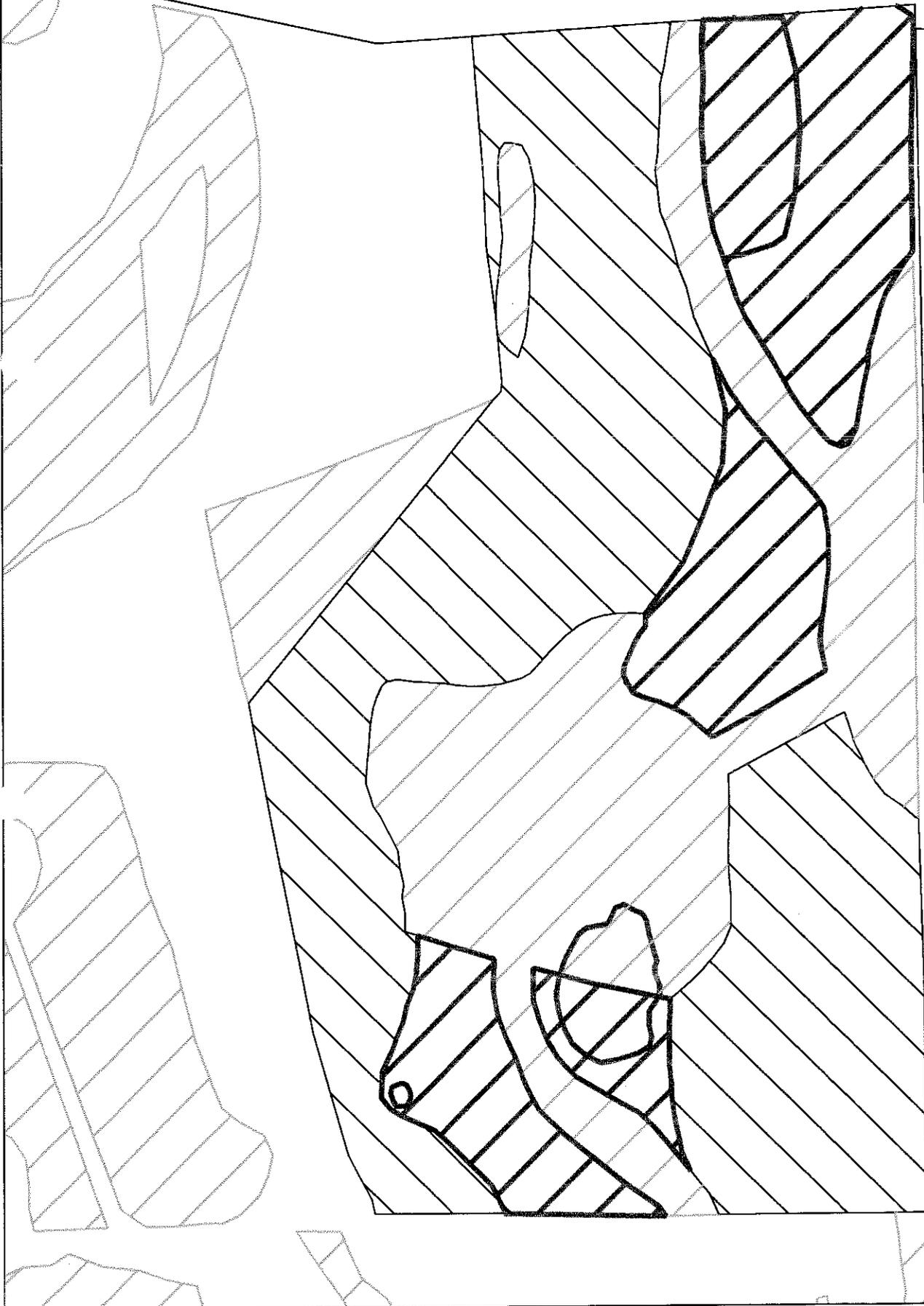


FIGURE 3

Appendix 5

Dennis Martins comments to EPA on draft report on Land Clearing proposal for Victoria Location 10641.

4th September 1998.

I am going to give a summary of the events so far, that have seen my proposal reach this stage of formal assessment under part IV of the Environmental Protection Act.

I purchased Victoria Location 10641, located 8 km west of the Brand Highway, on the Coorow-Greenhead Road in May 1987. Only one third of the property had been developed at this time. As from purchase, I have gone through all the appropriate channels for permission to develop the property.

- In 1988 permission was granted by David Kessell (Agriculture WA) to develop the remainder of the property in a total farm plan. This original farm plan involved leaving approximately 20% remnant vegetation.
- In August 1995, after the Government brought in the new requirement for 20% remnant vegetation to be retained on agricultural land, I decided to reapply for the remaining 260 ha to be developed, which would complete the farm plan. I was confident that my application would be approved as we had already been retaining large areas of natural vegetation. I had fenced an area of 100 ha at my expense. All creeks are left lined with substantial vegetation, and areas of wandoo timber and heathland vegetation have been retained. I wish to point out that we never received notification from Ag WA that all previous permission was invalid, and that we had to reapply. We decided to reapply after hearing about the new ruling from the media.
- On the 21st of September 1995, Peter Whale, from Ag WA Three Springs, came and inspected our property.
- In November 1995, we received a map, dated 14/11/95, indicating where we could clear, and areas to be left remnant.
- In January 1996, David Stanton (Ag WA) phoned to inform us that our application had been incorrectly processed, by not being forwarded to the Commissioner for Soil and Land Conservation. He said he would be visiting us in the near future to discuss the matter further. Clearing had not commenced at this time as burning is totally prohibited during the summer months, but we would have started in March 1996.
- On 20th of March 1996, David Stanton and Martyn Keen (Ag WA Geraldton), visited to discuss the matter. They advised that the application would be reprocessed and it would be completed in 6-8 weeks.
- In May 1996, Terry Brooks (Ag WA) conducted a level 2 assessment on the property, but left the department before finishing the report. After numerous phone calls to find out what was happening, I was told that it would have to be redone.
- On the 7th of February 1997, Martyn Keen redid the level 2 assessment.
- In April 1997, we received a letter from John Duff (Deputy Commissioner for Soil and Land Conservation) to say that the Commissioner was satisfied that land degradation would not occur provided clearing was carried out in accordance with an Agreement to Reserve Plan. However as the application had now come under the new guidelines of the Memorandum of Understanding (MOU), the Working Group

Dennis Martins comments to EPA on draft report on Land Clearing proposal for Victoria Location 10641.

Committee were concerned about the presence of rare flora on the area in question. We were advised that a Declared Rare Flora (DRF) survey would need to be done, at our own cost. We obtained a quote for \$2600 from Hart Simpson and Associates (Environmental Consultants). We felt that spending this amount of money was unjust as the Government Departments involved with my application had caused the major delays, resulting in the application coming under new guidelines. I was put in contact with Andrew Watson (Ag WA) at this stage, who followed through my concerns, and advised that Ben Carr (DEP) had been appointed to organise the DRF survey.

- In April 1997, we also received a letter from Mr M O'Donoghue on behalf of Mr Syd Shea (Conservation and Land Management). He sent an outline of requirements for the DRF survey. He also stated that should rare flora be located on our property, and agreement between myself, Dept of CALM, and the Commissioner not be reached on the protection of the populations, then our application maybe referred to the EPA for environmental assessment.
- The DRF survey was conducted on 4th of November 1997. Ben Carr said the report would be completed by 11th of November, and that he would forward me a copy, at my request. After numerous phone calls to Ben Carr, I was finally faxed a copy of the report by Andrew Watson (AgWA) on 10th of December 1997. No rare flora had been identified, however some priority flora had been identified, predominantly in an area that we had already agreed to leave as remnant vegetation in our original application. We received a letter from Andrew Watson (Ag WA) at this time advising us that the EPA were going to discuss our proposal on December 18th. I phoned Ben Carr to see what time the meeting was going to be as I wanted to be in attendance. He told me that it was 'nt going to be discussed as a decision had already been made that further assessment would be required. We were not formally notified of this decision until April 1998. We have been prepared at every stage of this process to protect rare, or priority flora. This action was extremely arrogant, and completely contradicts the statement made by Mr O'Donoghue from CALM, that it would only be forwarded to the EPA if we could 'nt agree to preserve rare or priority flora.
- On the 15th of April, we were informed by letter from Mr Bernard Bowen, Chairman of the EPA, that our proposal will be formally assessed under the provisions of the Environmental Protection Act.
- In July we received the EPA draft report on our proposal.
- On 20th of August 1998, we met with the EPA and DEP in Perth, to discuss the draft proposal. An agreement was made for a representative from the DEP and a botanist to come on site and see if we could negotiate an agreement on our proposal.
- On 2nd of September, Kim Taylor (DEP), Andrew Watson (Ag WA), and Mr Ted Griffin (botanist), came and inspected the area, and we were able to indicate what areas we were prepared to leave remnant, in an effort to compromise with the DEP and EPA in their desire to have a nature corridor retained on our property.

Dennis Martins comments to EPA on draft report on Land Clearing proposal for Victoria Location 10641.

- We would like the EPA to include in the report to the Minister the truth about the delays in our proposal being processed. Our NOIC was lodged in August 1995, (19 months before the MOU was formally adopted), not the 31st of January 1996. If the Minister is to give consideration with any objectivity to our proposal she needs to see the summary of events that I have sent you. It is now 3 years since we applied, and no amount of apologies can make up for loss of income and the unnecessary stress we have suffered. The EPA states that it is of the view that the proposal should be considered in general accordance with the principals of the MOU. How is the Minister supposed to have any objectivity with a comment like that? Dr Brian Jenkins told us at the meeting we had with the EPA and DEP, that consideration would be given to us because of our unfair proposal application. What consideration does he think we deserve?
- The EPA considers that the vegetation covered by the proposal should be retained because of the conservation value, particularly its corridor value in linking a nature reserve and a national park. Could you please let the Minister know very clearly that the area in question lies approximately 2 kms north of the Mt Lesueur National Park, and 8 kms south of the Eneabba Nature Reserve. I would hardly call that a link. Even if it was, it is an unfair reason to block the proposal. We are being disadvantaged due to the large tracts of National Park and Vacant Crown Land in our district. This property was on the open market 11 years ago. If the Government had'nt been so short sighted they could have purchased it then. Remember, this is a farm we are designing, not a National Park. We are more than happy to preserve priority flora and leave 20% remnant vegetation. If the Minister is not happy with the corridors that we have recently agreed to leave, then the Government will have to be prepared to purchase Victoria Location No 10808, in exchange for our farm. It can then waste Government funds to its hearts content revegetating the whole property. With the corridors that we have agreed to leave, in an attempt to compromise with the DEP and EPA, we will in fact now be leaving approximately 25% remnant vegetation. We cannot afford to leave any more, as the property will not be a viable size for agriculture.
- Viability of remnant vegetation on the property. I do not see that it is the EPA's business to be assessing any other area than the area in question. We have already fenced off 100 ha at our cost, have fenced some water courses, and have plans to fence off other areas of remnant vegetation. If we had'nt been 'stuffed' around in the manner that we have, alot of them would have been fenced now. Our plans for the farm have been put on hold for 3 years now, pending an outcome on our proposal. The fact that you see the viability of remnant vegetation on the rest of the property an environmental factor, suggests to the minister, that the areas are not being managed. I don't hear of Ag WA, DEP or EPA going around dictating to landholders in general, that they must fence off remnant vegetation, or manage it in a particular way.

Dennis Martins comments to EPA on draft report on Land Clearing proposal for Victoria Location 10641.

- Agreements to Reserve. The draft report mentions that I intend to include approximately 187 ha remnant native vegetation in an Agreement to Reserve Plan. I have never had any one discuss this with me.
- The report mentions the size of Mt Lesueur National Park as being 27500 ha, and not large for a conservation reserve. This statement is very misleading. Adjoining the Mt Lesueur National Park are large tracts of remnant vegetation, being, Drovers Cave National Park, Beekeepers Nature Reserve, Stockyard Gully Reserve, and Lake Logue Nature Reserve. These reserves, combined with Mt Lesueur, would total 92500 ha. If the government is so concerned with increasing the size of Mt Lesueur National Park, why did'nt they negotiate with the previous owners of Victoria Location 10351, which adjoins the south end of Mt Lesueur and is mostly undeveloped. This property was sold about 12 months ago. This would have enabled Mt Lesueur National Park to be linked to the Coomallo Nature Reserve.
- I have been a Volunteer Fire Fighter for 20 years, and have held the position of Chief Fire Brigade Officer of the Warradarge Brigade for the last 4 years. I have held the position of Deputy Chief Fire Control Officer of the Coorow Shire for the last 4 years. Most of the fire control work has been in National Parks and Vacant Crown Land. As myself and other landholders live near these large tracts of bush, we are on the scene instantly, when fires start. We do not get paid for this. It is impossible for the Bush Fires Board and CALM to mobilise enough force within 6-8 hours of a fire starting. If the treatment that we, and other landholders in this district are receiving continues, many landholders will be withdrawing their voluntary services, and equipment from fighting fires in Government owned parks and reserves.
- Why has'nt the government consulted with the Shires of Dandaragan and Coorow, and local landholders, for their views? We are being dictated to by city based beaurocrats, who are totally unaffected by the decisions that they make.
- In the discussion paper for 'Planning for Agricultural and Rural Land Use', on page 3 there is a comment on the Cabinet Position Statement. It states - "The Western Australian Government considers that productive agricultural land is a finite national and State resource that must be conserved and managed for the longer term. As a general objective, the exercise of planning powers should be used to protect such land from those developments, activities or influences that lead to its alienation or diminished productivity, while always accepting the need for land for expanding urban areas and other uses of State significance."