

2012

ENVIRONMENTAL ASSESSMENT REPORT

**PROPOSED SALE OF COMMONWEALTH LAND
AT THE BUSHMEAD RIFLE RANGE SITE
TO HOMESWEST
FOR A RESIDENTIAL DEVELOPMENT**

COMMONWEALTH ENVIRONMENT PROTECTION AGENCY

an agency of the
DEPARTMENT OF THE ENVIRONMENT, SPORT
AND TERRITORIES

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SUMMARY OF RECOMMENDATIONS

Australian Estate Management (AEM) is proposing a partial sale of Commonwealth land at the Bushmead Rifle Range site in Perth to Homeswest for a housing development. The Bushmead site is situated on the eastern urban fringe of Perth at the foothills of the Darling Scarp.

On account of the high conservation values of areas of the Bushmead Rifle Range site, part of which has been entered in the Interim List of the Register of the National Estate, the Commonwealth Environment Protection Agency (CEPA) recommends the establishment of a conservation reserve over much of the site. CEPA's recommendations are as follows.

- (a) That a conservation reserve be established at the Bushmead Rifle Range comprising areas which have been placed on the Interim List of the Register of the National Estate; the Jarrah/Marri, Marri and Wandoo woodland areas between the south-east boundary of the national estate area and Ridge Hill Road; the Marri/Jarrah woodland area to the north-east of Kadina Brook; and the cleared rifle range between the two national estate areas in the north-west of Bushmead.
- (b) That AEM and the Department of Defence hold discussions with CALM about the possibility of management of the proposed Bushmead conservation reserve by that agency and the most appropriate means by which that could be effected.
- (c) That measures for the protection of the Southern Brown Bandicoot population at Bushmead be developed based, if appropriate, on a study of the dynamics of the regional bandicoot population.
- (d) That public access roads should not pass through the recommended conservation reserve, but should be restricted to its outer boundaries.
- (e) That any housing development on the remaining Bushmead land be conducted in a manner that would avoid adverse impacts on the recommended conservation reserve, and that detailed development plans for any such development be prepared in consultation with CEPA, the AHC, CALM and other relevant local and State planning authorities.
- (f) That AEM and the Department of Defence investigate the inclusion of the 10th Transport Squadron area in any future housing development.
- (g) That stormwater retention basins and sub-surface drains, as proposed in the EIS, be included as appropriate in any further proposal for housing development at Bushmead on the areas outside of the recommended conservation reserve.

- (h) That dieback mapping of Bushmead should be carried out prior to any construction and rehabilitation works in either the recommended conservation reserve or any housing development in areas outside that reserve, and that safeguards (approved by CALM and the WA EPA) to prevent the spread of dieback should be implemented during construction activities.
- (i) That appropriate vegetation rehabilitation measures for any housing development outside of the recommended conservation reserve be implemented by the developer in consultation with relevant authorities.
- (j) That measures to control soil erosion (including, as appropriate, those measures proposed in the EIS) be implemented in any housing construction outside of the recommended conservation reserve, and that the effectiveness of these measures be monitored with a view to implementing any necessary remedial action.
- (k) Before commencement of any works on the Bushmead site or the opening of the area to public access, a site remediation plan for the cleanup of soil contaminants and ammunition or unexploded ordnance should be prepared and implemented to the satisfaction of the WA EPA and the Department of Health.
- (l) Caveats should be entered against each individual title created in relation to any future housing development at Bushmead requiring owners to immediately notify the relevant authorities of the discovery of any live ammunition or unexploded ordnance.
- (m) That, in the event a housing development proceeds at Bushmead in the areas outside of the proposed conservation reserve, a water quality protection and management program as proposed in the EIS, including monitoring by the Water Authority of WA and the Waterways Commission, should be established.
- (n) That the feasibility of including the former abattoir effluent disposal area in the recommended conservation reserve be investigated in the context of the discussions with CALM referred to in recommendation (b).
- (o) That measures proposed in the Draft EIS for the control of environmental impacts during construction activities would also be appropriate for any further housing development proposal for the areas at Bushmead outside of the recommended conservation reserve.
- (p) That a traffic impact study should be conducted in relation to any future proposed road developments at Bushmead, whether in relation to access to the recommended conservation reserve or any housing development on other areas.
- (q) That an independent assessment of the Aboriginal significance of Bushmead be carried out by a consultant acceptable to the Fringedwellers of the Swan Valley before arrangements for the management of the recommended

conservation reserve and any housing development plans for the remaining areas at Bushmead are finalised.

- (r) That an Environmental Management Program (EMP) for any housing development at Bushmead outside of the recommended conservation reserve should be prepared in consultation with CEPA, the AHC and relevant State and local authorities, and provided to CEPA and these authorities for comment prior to the commencement of the development.
- (s) That the developer's responsibility for implementing the EMP should not cease until the completion of the construction phase and any rehabilitation measures, and that after this period responsibility should be transferred to the relevant State and local authorities.
- t) That the developer of any housing development be bound contractually to specific environmental requirements and commitments identified in the EIS process and CEPA's assessment report, and that this measure be implemented in association with the EMP.

1. INTRODUCTION

The purpose of this report is to assess the environmental implications of the proposed partial sale of Commonwealth land at the Bushmead Rifle Range to Homeswest, the West Australian Government body responsible for public housing, for a housing development. The report is prepared in accordance with paragraph 9 of the Administrative Procedures to the *Environment Protection (Impact of Proposals) Act 1974* (the Act).

The report takes into account the Draft Environmental Impact Statement (EIS), the submissions received on the Draft EIS from private individuals, community groups and government bodies and the responses to these submissions contained in the Supplement to the Draft EIS. The Supplement and the Draft EIS together comprise the Final EIS.

1.1 Background

A report compiled by the Housing Industry Association in February 1989 detailed the shortage of readily developable land for low cost housing in Australia. At the Special Premiers' Conference on Housing on 3 March 1989, the Commonwealth put forward a national strategy for under-utilised Commonwealth land within urban areas to be made available for housing developments. As a result, it was proposed that a portion of the Defence land at the Bushmead Rifle Range site should be released for development by Homeswest.

1.2 Environmental Impact Statement and Public Review Process

On 12 October 1989, the proponent, the Australian Property Group (part of the Department of Administrative Services), submitted a Notice of Intention (NOI) under paragraph 2 of the Administrative Procedures to the Act to the then Department of the Arts, Sport, the Environment, Tourism and Territories. The NOI was released for public comment from 5 December 1989 to 31 January 1990 as a consequence of an undertaking made to the Senate by the then Minister for the Arts, Sport, the Environment, Tourism and Territories, Senator Graham Richardson. The then Senator Fred Chaney had raised in the Senate the question of the degree of public concern generated by the proposal. A total of 45 submissions were received on the NOI.

Just prior to the release of the NOI, the Bushmead Rifle Range site was nominated for inclusion on the Interim List of the Register of the National Estate.

On 20 March 1990, Senator Richardson directed the preparation of an EIS in accordance with the Administrative Procedures to the Act. A Draft EIS was prepared for the proposal by the proponent and released for public exhibition and comment from 12 April to 5 June 1992. As a consequence of receiving and examining

earlier public comments on the NOI, in the Draft EIS the proponent revised the original proposal by reducing the number of housing lots in the preferred option from approximately 2,000 to 1,200. This revision reduced the proposed number of residences from around 6,500 to 3,500 and increased proposed conservation areas within the site. During the public review period a total of 51 submissions were received from private individuals, conservation groups, and State and Commonwealth Government departments and authorities. In its submission, the Australian Heritage Commission (AHC) indicated it had decided on 5 June 1992 that portions of the Bushmead Rifle Range, along with a small area of an adjoining Main Roads Department reserve and private property, would be entered in the Interim List of the Register of the National Estate.

On 23 October 1992, the Commonwealth Environment Protection Agency (CEPA) received from the proponent, now Australian Estate Management (AEM), the Supplement to the Draft EIS responding to issues raised in the public submissions.

On 17 November 1992, CEPA was informed by the AHC that portions of the Bushmead site had now been placed on the Interim List of the Register of the National Estate, in recognition of its significant natural values. As a consequence, it was agreed between CEPA and AEM that completion of the environmental assessment process should be postponed to enable the AHC to finalise the process relating to the placement of the Bushmead site on the Register of the National Estate. This process would involve examination of any objections to the interim listing and any consequent further consideration of the worthiness of the site for placement on the Register. The assessment period agreed between CEPA and AEM, in accordance with subparagraph 9.4(d) of the Administrative Procedures, was extended to 30 June 1993.

The final decision to place the portions of the Bushmead site with significant natural values on the Register of the National Estate was made on 7 June 1993 by the AHC. The formal gazettal is expected to occur later in 1993.

1.3 Consultation

In addition to the submissions received during the public review periods of the NOI and Draft EIS, the AHC and the Aboriginal and Torres Strait Islander Commission (ATSIC) provided comments on the draft of the Supplement. Comments were also received on the final Supplement by the Western Australian Environmental Protection Authority (WA EPA) and the AHC.

Since the Interim Listing on the Register of the National Estate of portions of the Bushmead Rifle Range site, roundtable discussions were held between CEPA, AEM, the AHC and the Department of Defence.

Site inspections were conducted by officers of CEPA in November 1990 and February 1993. A meeting with various community groups took place during the November 1990 visit. The February 1993 site inspection included officers of the AHC, AEM and the Western Australian Department of Conservation and Land Management (CALM).

2. THE EXISTING ENVIRONMENT

2.1 Surrounding Land Uses

The Bushmead site is situated at the eastern urban fringe of Perth, approximately 15 kms east of the Perth CBD (refer to Map A). The site is situated within the Shire of Swan and abuts the Shire of Mundaring to the north/north-east and the Shire of Kalamunda to the south/south-east.

This region is characterised by a mix of semi-rural developments, industrial facilities, conservation and recreational areas. Gooseberry Hill National Park is situated immediately south-east of the Bushmead Rifle Range site from which it is separated by Ridge Hill Road. Immediately south, and adjacent to the 10th Transport Squadron land (see 2.2 below), is a residential area with lot sizes varying from 2,000m² to 4,000m². To the south-west lies an 18-hole public golf course. Land to the west of the site, between Midland Road and the Roe Highway, is currently zoned "rural" and contains poultry farms with associated housing, a caravan park and a tavern/restaurant. West of the Roe Highway the land is largely vacant apart from some light industrial activities, including two rendering plants.

To the north-west lies the suburb of Hazelmere for which industrial development is planned. A residential housing development, known as the Helena Valley Estate, is planned to be located on cleared grazing land along part of the north-eastern boundary of Bushmead. This proposal was approved in mid-1992, and is envisaged to contain lot sizes of approximately 500m². A Main Roads Department reserve, approximately 500 metres in length and 200 metres in width, adjoins Bushmead and Ridge Hill Road in the south-east. This area has been described in the Draft EIS as containing vegetation of high conservation value and the southern portion has been placed on the Interim List of the Register of the National Estate.

2.2 Past and Present Land Uses of Bushmead

The Bushmead Rifle Range was established in 1915. The site occupies an area of 296 hectares in the foothills at the transition from the coastal plain to the Darling Scarp. Kadina Brook (which flows into the Helena River, a tributary of the Swan River) bisects the site roughly into eastern and western portions. The north of the site is relatively flat with a gradient of less than 1 in 20. The southern section and the Kadina creekline are generally steeper with gradients varying from 1 in 20 to greater than 1 in 5 as the land rises towards the Darling Scarp.

Existing uses of the site are shown in Map B. There are 2 live firing ranges (a rifle range and a 25m pistol range) located in the northern part of the site and used by the Defence Forces, the Police Department, other Government departments and civilian clubs. The other main user of the site is the 10th Transport Squadron, whose facilities (including a driver training circuit and staff housing) occupy 66 hectares at

the south-western corner of the site. The 10th Transport Squadron was relocated from Buckland Hill to its present site at Bushmead approximately 5 years ago.

The majority of the site, with the exception of the 2 live firing ranges in the northern portion, was leased for grazing of cattle and sheep from 1953 to 1982. The Draft EIS indicates that at that time the site was subjected to frequent, severe overstocking, which caused the replacement of large tracts of native understorey by pasture grasses and invasive weed species. Several submissions have indicated that some native revegetation has occurred since grazing ceased, particularly in areas with good canopy cover. Subsequent observations by CEPA officers on site visits support these claims.

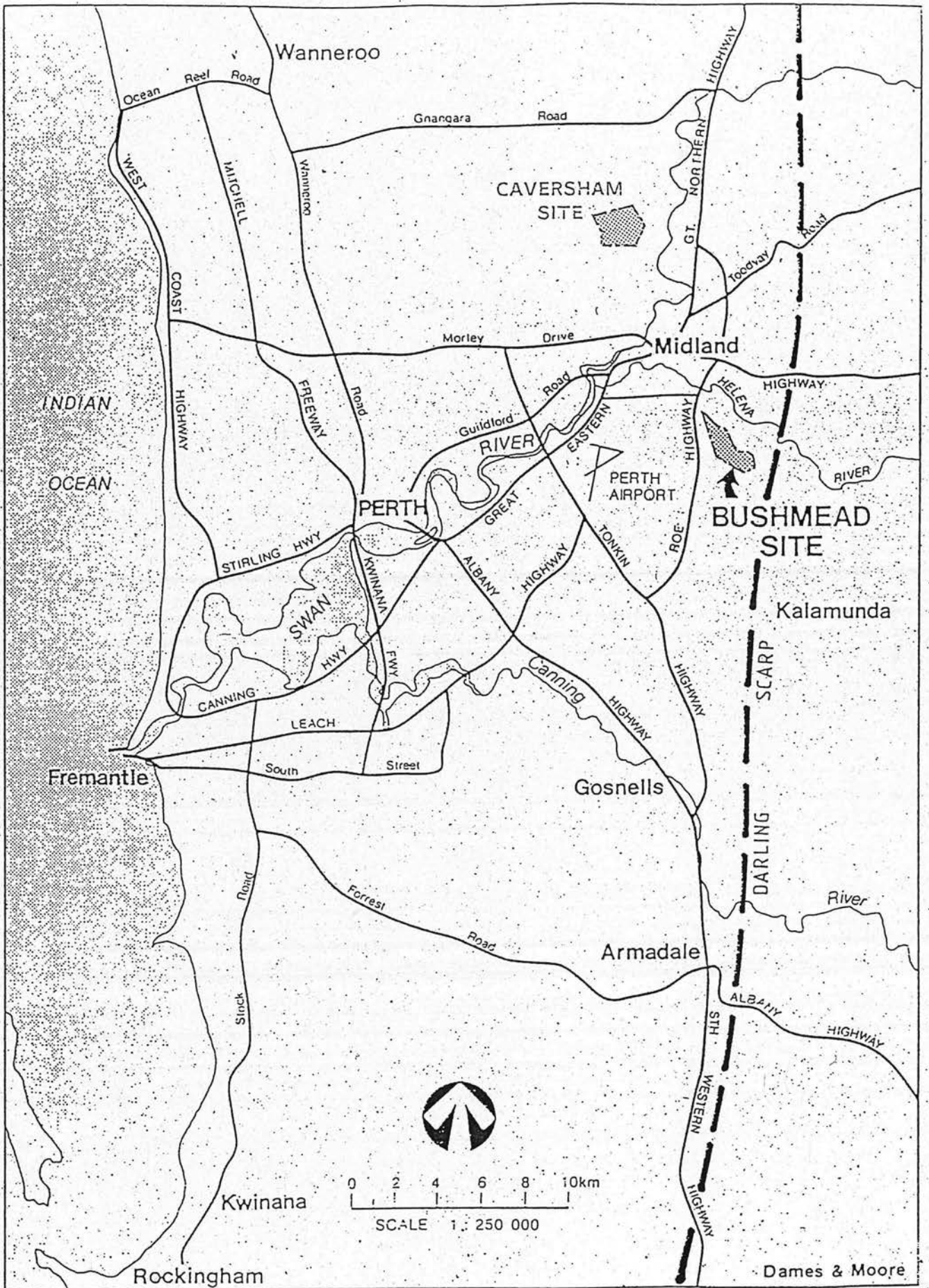
The Midland Abattoirs held a licence for the disposal of effluent towards the south-eastern portion of the site from 1970 to 1982 (refer to Map B). This operation was terminated due to increasing complaints of odours, flies and the introduction of noxious weeds. This area has been rendered largely treeless and there are large concentrations of nitrates in the groundwater.

2.3 Flora

Despite past disturbances, the Draft EIS identified the Bushmead site as containing in excess of 300 plant species, including 240 native species. The vegetation communities at Bushmead are shown in Map C. The assessment of vegetation in the Draft EIS was based on an intensive biological survey of the site carried out by the environmental consultants, Ecologia, between May and October 1991.

Significant features of the Bushmead vegetation and its conservation value as assessed by the proponent are outlined below.

- The north-west corner of the site, surrounding the cleared rifle range, contains Banksia/Allocasaurina and Banksia/*Eucalyptus totidiana* woodland with a dense understorey and high species diversity. The proponent considers this area to have very high conservation value.
- The area to the east of Kadina Brook contains vegetation associations characteristic of the Ridge Hill Shelf system (see 4.3 for description). The main vegetation associations are as follows.
 - an area of Marri/Jarrah woodland in the north-east, considered by the proponent to have moderate conservation value;
 - Banksia/Allocasuarina, Jarrah/Banksia and Marri/Jarrah Banksia woodland in the central portions, with a less dense understorey than in the north-west of the site, and considered by the consultant to range from moderate to high conservation value;
 - Jarrah/Marri woodland and Marri open woodland in the south-east adjacent to Ridge Hill Road, with a highly modified understorey

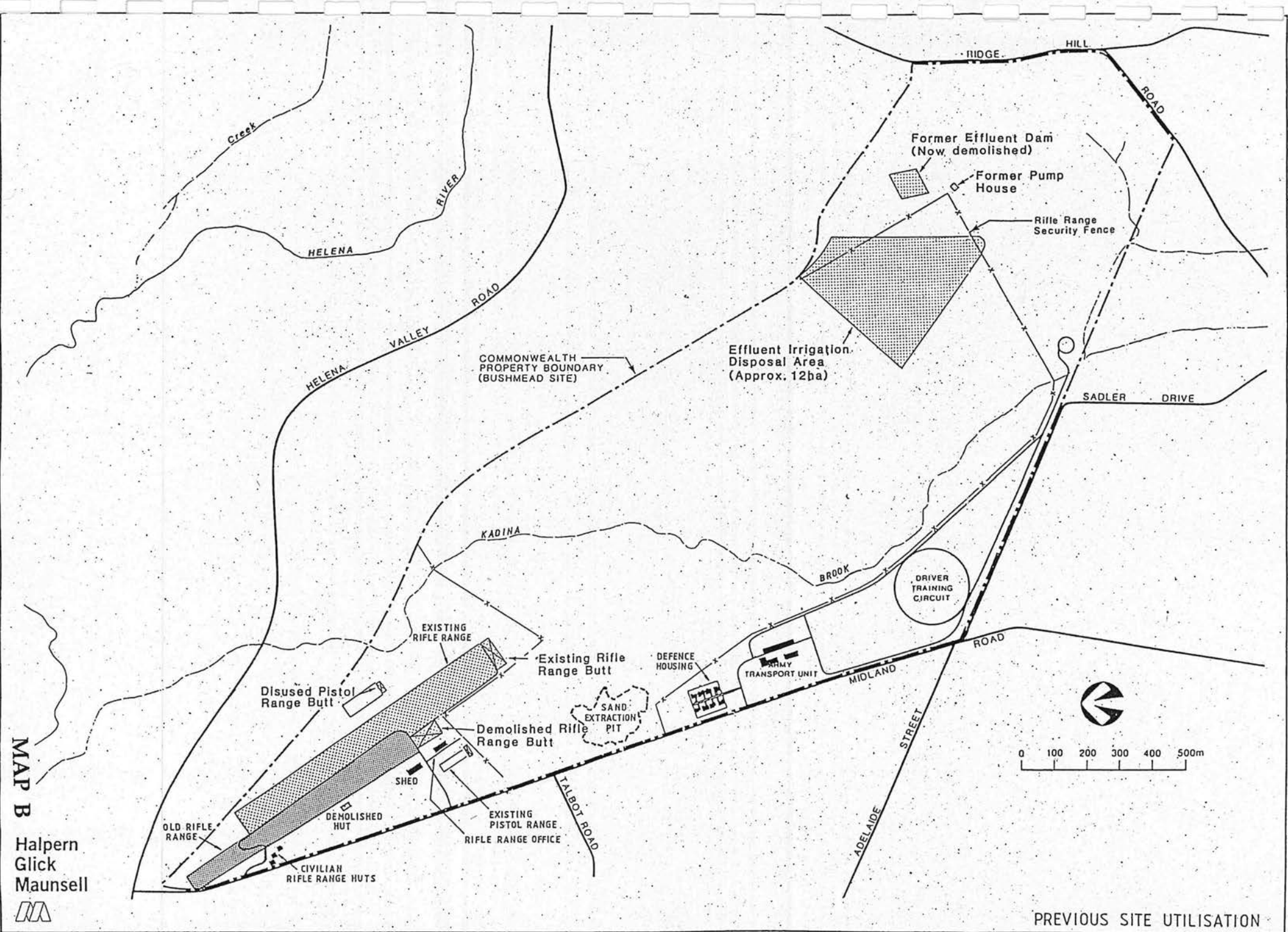


Halpern
Glick
Maunsell


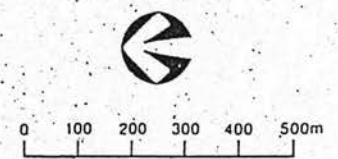


MAP A

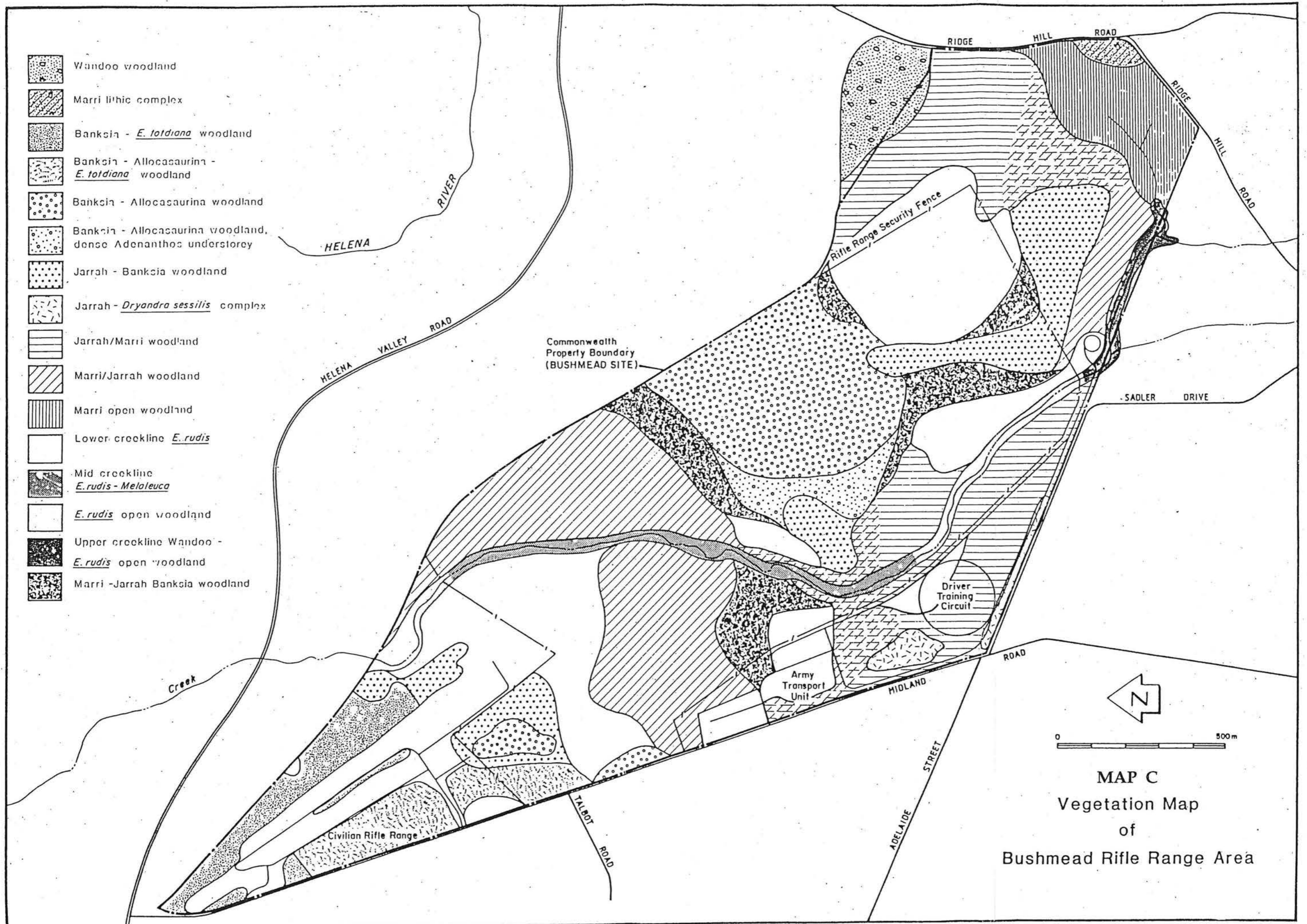
SITE LOCATION



















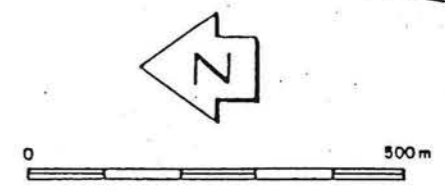
MAP B
Halpern
Glick
Maunsell

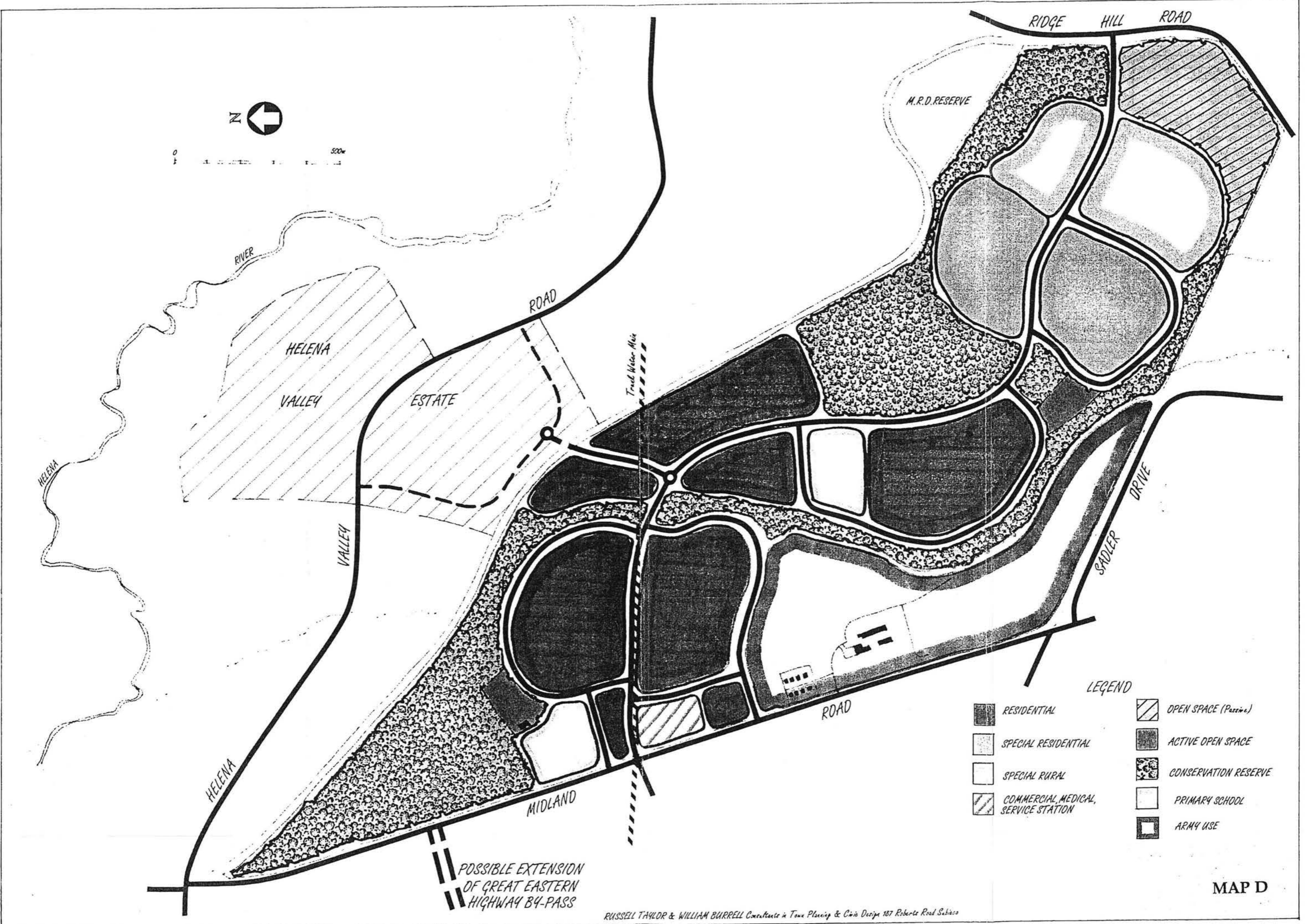
PREVIOUS SITE UTILISATION



-  Wandoo woodland
-  Marri lithic complex
-  Banksia - *E. totdiana* woodland
-  Banksia - Allocasaurina - *E. totdiana* woodland
-  Banksia - Allocasaurina woodland
-  Banksia - Allocasaurina woodland, dense Adenanthos understorey
-  Jarrah - Banksia woodland
-  Jarrah - *Dryandra sessilis* complex
-  Jarrah/Marri woodland
-  Marri/Jarrah woodland
-  Marri open woodland
-  Lower creekline *E. rudis*
-  Mid creekline *E. rudis* - *Melaleuca*
-  *E. rudis* open woodland
-  Upper creekline Wandoo - *E. rudis* open woodland
-  Marri - Jarrah Banksia woodland



MAP C
Vegetation Map
of
Bushmead Rifle Range Area



0 500m

RIDGE HILL ROAD

M.R.D. RESERVE

RIVER

HELENA VALLEY

ESTATE

ROAD

Trunk Water Main

SADLER DRIVE

ROAD

HELENA

VALLEY

MIDLAND

POSSIBLE EXTENSION OF GREAT EASTERN HIGHWAY B4-PASS

LEGEND

- RESIDENTIAL
- OPEN SPACE (Passive)
- SPECIAL RESIDENTIAL
- ACTIVE OPEN SPACE
- SPECIAL RURAL
- CONSERVATION RESERVE
- COMMERCIAL, MEDICAL, SERVICE STATION
- PRIMARY SCHOOL
- ARMY USE

MAP D

dominated by introduced grasses, and considered by the proponent to be of moderate conservation value; and

- an area of Wandoo woodland in the south-east corner, considered by the proponent to have high conservation value.
- The area along the creekline of Kadina Brook has been broadly classified as *Eucalyptus rudis* / *Melaleuca raphiophylla* woodland. The native understorey in parts of the creekline, particularly the upper and lower sections, is degraded and introduced species predominate. Despite the degradation of the vegetation in this area, the proponent considers the creekline to have conservation value "...due to the scarcity of creeklines within the Ridge Hill shelf system which remain comparatively unaffected by quarrying or urbanisation" (Draft EIS, 5.9.2, page 47).

2.4 Fauna

A fauna survey was conducted at Bushmead by Ecologia during 3 seasons in 1991. The survey recorded 60 bird species, 5 native and 5 introduced mammals, 41 reptiles and 7 amphibians. The survey added an additional 39 bird, 6 frog, 9 reptile and 5 mammal species previously unrecorded for the Bushmead site.

The Southern Brown Bandicoot, which has been listed in Schedule 1 of the (WA) *Wildlife Conservation Act 1950* as "likely to become extinct, or is rare" was found in the Kadina creekline and the southern portions of the site. Evidence could not be found by Ecologia to substantiate claims that another animal listed in Schedule 1, the Chuditch or Western Quoll, was present at Bushmead. The EIS noted that the Bushmead site is a potential transient foraging ground for this animal and probably not a core part of the home range. It was concluded that, based on known territory sizes, only 2 or 3 of these individuals at the most would utilise the Bushmead site. The Chuditch has been listed as an endangered species in Schedule 1 to the Commonwealth's *Endangered Species Protection Act 1992*.

The Draft EIS indicated that Baudin's Black Cockatoo, listed in Schedule 2 of the *Wildlife Conservation Act 1950* as "in need of special protection" was recorded at Bushmead. In its submission on the Draft EIS, CALM indicated that this may have been a misidentification of Carnaby's Black Cockatoo (which is also a specially protected animal).

3. THE PROPOSED DEVELOPMENT

3.1 Description of the Proposal

Map D shows the preferred "gradational development" option put forward in the Draft EIS. Approximately 1,150 housing lots (in 3 areas of different densities) are proposed for development over a period of at least 5 to 7 years.

An area of about 91 hectares (or 30.7% of Bushmead), towards the north and central portions of the site, and split by Kadina Brook, is proposed for "Residential" development at a density of between 10 and 12 lots per hectare. The residential density is proposed to decrease further east, where an area designated for "Special Residential" development would contain lots ranging between 2,000m² and 3,500m². The 31.3 hectares in this area would yield approximately 98 lots.

A "Special Rural" area, with lot sizes at a minimum of 1 hectare, is proposed on the higher southern levels of the Bushmead site, close to Ridge Hill Road. A total of 24.5 hectares would be set aside, yielding approximately 19 lots. The draft EIS indicated that "Special Rural" zoning would require limitations on clearing, special building and fencing standards and the definition of building envelopes. The areas proposed for "Special Residential" and "Special Rural" development are in the steeper sections of the site and contain a good tree canopy.

A number of other facilities are proposed for the Bushmead development. These include two primary schools, a small local shopping centre with floor space not exceeding 3,000m², an internal road network and provision for electricity, water supply and sewerage facilities.

The proposed development would allocate approximately 93.5 hectares (or 31.6% of Bushmead) as open space reserves. These reserves would be mainly located on areas considered by AEM to have higher conservation value, and would be interspersed with the various elements of the housing development. These areas include:

- a 50 metre corridor along Kadina Brook;
- the high quality of Banksia/Allocasuarina and Banksia/*Eucalyptus totidiana* woodland in the north-east corner of the site and the adjacent rifle range;
- the Banksia/Allocasuarina woodland situated midway along the eastern boundary; and
- the woodland adjacent to Ridge Hill Road.

AEM proposes that the degraded parts of these proposed open areas should be rehabilitated by the developer.

3.2 Alternatives

An area of 324 hectares of Commonwealth land at Caversham (see Map A), 18 km north-east of the CBD, was discussed in the Draft EIS as an alternative housing development site. AEM rejected this site because of the high cost (in the order of \$15 to \$20 million) of relocating the Air Force communication facilities currently on the site and the presence of wetlands which are likely to have sufficiently high conservation value to warrant protection against development.

Four potential alternative uses of the Bushmead site were evaluated in the Draft EIS in terms of their ability to meet the need for housing in the Perth area and environmental factors, as summarised below.

OPTION	EVALUATION IN DRAFT EIS
1. Do Nothing	<ul style="list-style-type: none"> • The site would remain under Commonwealth ownership and existing activities would continue. • Use of the site as a rifle range is not considered an efficient utilisation of land in such close proximity to central Perth. • Because of limited management control, feral animal intrusions and predation of native fauna, clearing for firewood, weed invasion and spread of dieback would continue. • There would be a detrimental effect on the current environmental attributes of the area.
2. Managed Parklands	<ul style="list-style-type: none"> • Public agencies would incur considerable management costs, as extensive rehabilitation and weed and disease control programs would be required. • The need for land suitable for residential development would not be addressed.
3. Gradational Development (AEM's preferred option)	<ul style="list-style-type: none"> • Meets the need for housing. • Provides some consistency of land use across the boundaries between the Shires of Mundaring, Swan and Kalamunda. • Coincides with an established trend towards decreasing levels of development from the coastal plain up into the foothills. • Would protect the viewshed from Gooseberry Hill National Park. • Provides for the conservation of areas of high conservation value and important vegetation associations.

4. More Intense Development

- Limited recognition of environmental values.
- Open space allocation would not be adequate to buffer against weed invasion, fire risk, pet intrusion etc resulting from adjacent residential developments.
- Does not recognise established and planned land uses within neighbouring shires.

4. THE CONSERVATION VALUE OF BUSHMEAD

4.1 Overview

The conservation value of the Bushmead site was a major focus of the environmental impact assessment of AEM's proposed housing development. The assessment process has revealed two distinctly different approaches to this issue and to the future patterns of use of the site. On the one hand, AEM proposes that the majority of the site be developed for housing with interspersed, small conservation areas. On the other hand, the AHC and CALM would prefer the establishment of a larger conservation reserve, particularly over areas to the east of Kadina Brook.

This part of the assessment report outlines these differing approaches and presents the case for CEPA's conclusions on the housing proposal in the EIS.

4.2 AEM's Approach

AEM has sought to develop a proposal which integrates the need for additional housing land in Perth with the protection of the areas of high conservation value at Bushmead. In its preferred "gradational development" option, open space reserves over areas generally considered by the proponent to have highest conservation value are interspersed with the proposed housing areas and linked by the proposed 50 metre corridor along Kadina Brook (see 3.1 and Map D). In order to protect the viewshed from vantage points in Gooseberry Hill National Park and in recognition of the value of the tree canopy at Bushmead, it is proposed that as much as possible of the canopy cover would be retained in the more elevated, low density housing areas in the south of the site.

In response to criticisms in the CALM submission, AEM acknowledges in the Supplement that its proposed development would have an impact on fauna habitat. Its response to the CALM submission indicates that the rehabilitation of areas proposed to be retained for conservation (such as the creekline and the rifle range) would have a favourable impact on fauna habitat. On the question of maintenance of habitat corridors, AEM points out that nearby areas have the potential to perform this role. AEM argues that the formalisation of reserve status for the adjacent Main Roads Department area, and the rehabilitation of the stock route along the north eastern boundary of Bushmead would improve fauna habitat and corridor areas adjacent to the Bushmead site. CEPA has no knowledge of such plans for these

areas. The proponent also maintains that its proposal would allow for continued avian fauna movement from Gooseberry Hill National Park to the coastal plain.

A major premise of AEM's analysis of the impact of the proposal on fauna habitat is the contention that increasing pressures on native fauna at Bushmead is inevitable because of the increasing pressures of surrounding development. By taking this attitude, it is CEPA's view that the proponent has devalued habitat protection alternatives. For example, AEM expresses the view that: "Unless a major rehabilitation programme is undertaken across the site it is unlikely that there will be any major improvement in fauna habitat availability if a recreational park option is adopted" (Supplement, page 32). This comment implies that a well-managed conservation reserve is not a viable alternative, although the possibilities are not explored.

This approach is extended to AEM's proposal for the endangered Southern Brown Bandicoot. Additional data indicating that the Bushmead bandicoot population is contiguous with the populations in Gooseberry Hill National Park and adjoining land was presented in the CALM submission. AEM maintains that it is not possible to assess the significance of the Bushmead population of the bandicoot on the basis of current data, and points out the need for a regional study of the animal to determine the impact of the development of Bushmead on the regional population. Nevertheless, AEM dismisses the potential findings of such a study, putting forward the view that the maintenance of the Bushmead population is impractical and unachievable (Supplement, pages 9 and 30). The reasons for this view are as follows:

"The Proponent remains of the opinion that the long term survival of bandicoots on Bushmead will require significant protective measures to be taken to limit access by predators. However, there is also the practical problem of providing such protection and yet still allowing free migratory movements of the bandicoots between Bushmead and the National Park. The achievement of effective protection is therefore seen to have a low probability of success and this will be further eroded by future development of adjacent lands.

Effective protection of the bandicoot population will demand heavy restrictions on predator and therefore, public access and this is contrary to the expressed views of many respondents who see the Bushmead site being given over to recreational and conservation uses. There seems little community benefit in retaining the Bushmead site in its present state but with surrounding security fencing and heavy access restrictions." (Supplement, page 9)

In the Draft EIS, AEM proposes that the most appropriate management strategy for the Bushmead Southern Brown Bandicoot population is the translocation of the animals to an appropriate habitat free from the threat of predation by domestic animals. The Tutanning Nature Reserve in the wheatbelt area east of Perth is suggested as a suitable site. AEM proposes to seek CALM's assistance in the translocation program.

In the Supplement, AEM contests the conservation significance claimed for Bushmead by the AHC and CALM in their submissions (see 4.3 and 4.4 below). It is acknowledged that Bushmead's Ridge Hill Shelf vegetation system has some local and regional conservation significance as the largest remaining example of that system in the Perth metropolitan area. However, the Supplement (page 8) indicates that other areas within Perth contain examples of Ridge Hill Shelf vegetation, and mentions the Talbot Road Reserve, a local government reserve of 88 hectares which is claimed to have vegetation that is more diverse and in better condition than the vegetation at Bushmead. The Draft EIS and Supplement also dispute that the Ridge Hill Shelf system itself is of State significance (as claimed by CALM), as the separate elements of this system are very wide spread in the south-west corner of Western Australia.

4.3 Views of the Australian Heritage Commission

The AHC has decided to place the area at Bushmead indicated on Map E on the Register of the National Estate in recognition of its significant natural values. As indicated above, the Commission decided to transfer this area from the Interim List to the Register on 7 June 1993, and the formal gazettal of this listing is awaited. A comparison of the maps of AEM's proposed development and the area on the Interim List of the Register of the National Estate (Maps D & E) indicates that much of the area on the Interim List would be utilised for housing development if AEM's proposal were implemented.

In summary, the main national estate values of Bushmead determined by the AHC are:

- the presence of a relatively large and little modified remnant of the Ridge Hill Shelf system geomorphic unit and its associated Forrestfield vegetation complex;
- a remnant of the Southern Rivers vegetation complex in very good condition;
- the presence of the endangered Southern Brown Bandicoot;
- the visually aesthetic connection of Bushmead with the adjacent Gooseberry Hill National Park.

In its submission on the Draft EIS, the AHC emphasises that the eastern portion of the Bushmead site (essentially that area to the east of Kadina Brook) is the largest substantially unmodified example of the Ridge Hill Shelf system geomorphic unit and its associated Forrestfield vegetation complex in the Perth metropolitan area, and is one of only four such areas remaining throughout the complete distribution of the complex. The Ridge Hill Shelf system occurs in a narrow belt (between 1 and 3 kms wide) at an elevation of 45 to 75 metres along ancient shorelines at the base of the Darling Scarp. The AHC indicates that only 3.1% of the original 14,414 hectares of the system remains in a substantially unmodified condition in the Perth area.

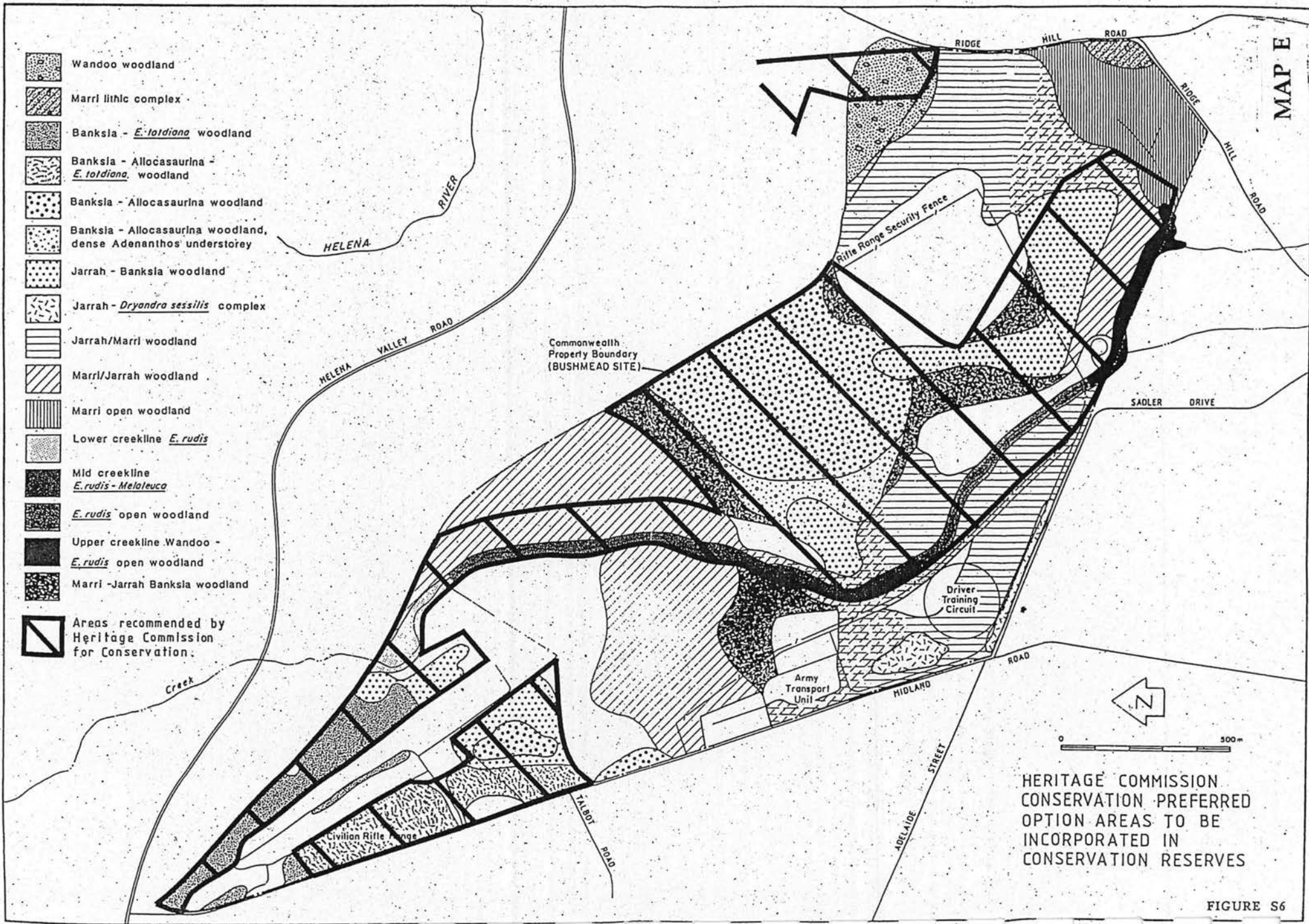


FIGURE S6

The Commission considers that AEM's proposal would have a significant adverse effect on the value of the site for the protection of the remnant Ridge Hill Shelf system. It points out that the development would cause the fragmentation of the area of the system at Bushmead and the retention of only 30% of the areas of the system entered in the Interim List.

The AHC also considers that Bushmead, together with Gooseberry Hill National Park (which is also on the Register of the National Estate), has particular value as a near-continuous transition from the Darling Scarp communities through the Ridge Hill Shelf system to the Swan Coastal Plain. Substantially unmodified examples of such a transition are now rare.

The Commission is also of the view that the proposed housing development would have a significant adverse impact on the habitat of the Southern Brown Bandicoot at Bushmead. Residential development of the southern part of Bushmead is seen as eliminating the possibility of interchange between the Bushmead and Gooseberry Hill National Park bandicoot populations, thus isolating the former population. The proponent's proposal to translocate the Bushmead bandicoot population is seen as making only a limited contribution to the objective of a secure population across the full range of the species. In an earlier submission on the preliminary draft of the Draft EIS, the Commission commented that "...relocation of a population of an endangered species should be an option of last resort, rather than one selected for convenience".

The AHC also expresses concern at the narrowness of the 50 metre reserve proposed along Kadina Brook and expressed doubts about the impact of the development on the endangered Chuditch (which is thought to use the Bushmead area). The Commission considers that the development proposed for the southern and eastern parts of the site would prevent the Chuditch from utilising the Bushmead area, but was unable to comment on the magnitude of the impact on the Chuditch population because of the lack of information on its size and distribution.

The Southern Rivers vegetation complex in the north-west of Bushmead (that is the area around the old rifle range) would, in the view of the AHC, be largely protected by one of the reserves proposed by AEM. However, the AHC does point out that about 35% of the area of this vegetation complex on the Interim List is proposed by AEM for the construction of a primary school and some housing.

The AHC is also critical of the way in which prudent and feasible alternatives are considered in the Draft EIS. The Commission considers that alternatives were presented "...in such a manner as to artificially enhance the attractiveness of the preferred option".

The AHC's preferred use of the Bushmead site is that:

- the area to the east of Kadina Creek should not be developed for residential purposes, but should be added to Gooseberry Hill National Park;

- the woodlands in the north-west of the site should be included in a reserve; and
- the balance of the site should be allocated a use which does not threaten the survival in situ of the Southern Brown Bandicoot population.

The AHC's submission on the Draft EIS also discusses other options (less favoured by the Commission) that would provide a greater degree of protection of national estate values than the proponent's preferred option.

CEPA understands that the boundaries of the areas placed on the Register of the National Estate have been determined by the extent to which particular areas currently demonstrate features worthy of national estate significance. In CEPA's view, the exclusion of an area from the Register does not imply that the area is unsuitable for conservation or that the use of the area would not have an impact on adjoining or nearby areas on the Register. Thus, CEPA considers that the duty on Commonwealth authorities under section 30 of the *Australian Heritage Commission Act 1975* to consider impacts on places in the Register would, in the case of Bushmead, extend to consideration of the impact of potential land uses in other areas of Bushmead on the places in the Register.

4.4 Views of the Department of Conservation and Land Management

As does the AHC, in its submission on the Draft EIS CALM emphasises the conservation value of the Bushmead Ridge Hill Shelf system and the importance of Bushmead in preserving the "full catena" (connected series of landforms/vegetation formations) from the Darling Escarpment to the Coastal Plain. CALM also points out the value of Bushmead in maintaining a fauna and flora corridor with the Gooseberry Hill National Park and the proposed Darling Regional Park. This latter Park is proposed to be formed of existing reserves along the Darling Range.

CALM contests a number of the claims in the Draft EIS relating to the conservation value of particular parts of the Bushmead site and the effectiveness of the conservation areas and other conservation measures proposed by AEM. The direction of these arguments is towards the need for the reservation of a contiguous, compact conservation area, rather than small, discrete reservations. According to CALM, AEM's preferred option would result in segregated, modified habitats that would not be large enough to retain viable populations of the larger mammals and reptiles that occupy the Bushmead area. Although the Draft EIS suggests that loss of habitat may be compensated for by the movement of fauna into adjoining bushland, CALM believes this would merely create additional competition for use of the remaining habitat. CALM is of the view that the loss of continuous vegetated areas would also severely restrict the movement of fauna within the Bushmead site and interchanges with Gooseberry Hill National Park.

In relation to the Southern Brown Bandicoot, CALM would prefer there to be no disturbance of the animals and their habitat at Bushmead. The importance of a corridor for these animals into Gooseberry Hill National Park is stressed. CALM considers a translocation program (as proposed by AEM) to be a "worst-case"

option. Removal of the Bushmead bandicoot population is seen as potentially affecting the long term viability of the surrounding populations and a further step in the attrition of the species on the coastal plain and foothills.

CALM also considers that a larger, contiguous conservation reserve would minimise the "edge" effects of the surrounding development and minimise the potential for disturbance of the conserved areas through weed introduction, the spread of dieback and vegetation removal. The proposed developments along both sides of the Kadina Brook are seen as potentially leading to a severe reduction of its conservation value.

CALM is sceptical of the success of AEM's proposal that the retention of mature native trees, the planting of native vegetation and the limitation of domestic pets be encouraged in the "Special Residential" and "Special Rural" areas of the proposed development. CALM indicates that such practices have not been achieved in comparable situations and points out the extensive clearing that has occurred in comparable developments near Bushmead.

CALM's preferred use of the Bushmead site is very similar to that put forward by the AHC. A large conservation reserve to the east of Kadina Brook is proposed, together with the conservation of the Kadina creekline and the woodland on either side of the rifle range. CALM also recommends that no access roads pass through the conservation reserves.

4.5 Views of the WA Environmental Protection Authority

In its submission on the Draft EIS, the WA EPA concludes that AEM's preferred option for development of the Bushmead site, including its proposals for protection of areas of high conservation significance, is "environmentally acceptable". The WA EPA also makes the following comment on the adequacy of AEM's proposed conservation areas:

"The areas indicated as having very high and high conservation value are generally proposed for conservation reserves. The viability of these areas to fulfil a conservation function should be determined by the Department of Conservation and Land Management. That Department will submit an independent submission to the proponent." (WA Submission to the Draft EIS, published as EPA Bulletin 632, 7.2, page 9)

The WA EPA made a further submission to CEPA on the Supplement, where it indicates that it has not considered the conservation proposals put forward by CALM and the AHC in their submissions. However, the Authority comments that

"...should DASET wish to recommend in favour of the options put forward by CALM or the AHC which propose a greater area for conservation, then the Authority would find this environmentally acceptable and should be encouraged..."

4.6 Other Views

It is acknowledged by AEM in the Supplement (page 4) that 27 submissions on the Draft EIS (out of a total of 51) refer to the establishment of parkland over the Bushmead site. Many of these submissions suggest that Bushmead be incorporated in the proposed Darling Range Regional Park or Gooseberry Hill National Park. Concerns mentioned in these submissions include the threat of development to the conservation values of Bushmead and the perceived adverse visual impact of the proposed development. A recurring theme is the threat of the proposed housing development to the semi-rural character and lifestyle of the foothills area. The adjoining Shires of Mundaring and Kalamunda were particularly concerned about the impact of the proposed development on the area east of Kadina Brook, which they identified as having high regional conservation value.

On the other hand, several submissions were supportive of the development and its proposed balance between conservation and development. The Shire of Swan, within which the Bushmead site is located, supported the general thrust of the development subject to some minor design alterations, including the conservation of the stock route and Main Roads Department reserve along the eastern boundary of Bushmead.

4.7 CEPA's Analysis

In assessing the conservation significance of Bushmead, CEPA shares the views of the experts in comparative conservation values, CALM and the AHC. The fact that other examples of the Ridge Hill Shelf system exist is insufficient justification for its development at Bushmead. The system is now extremely rare, as a system, and the value of each remaining area where the components of the system remain intact is correspondingly increased.

CEPA considers that AEM's proposal to divide the area into interspersed housing and conservation zones fails to give adequate weight to the conservation requirements of the various features of the site, their ecological relationships within the site and with other nearby bushland areas. Well-accepted principles of ecological conservation point to the close relationship between reserve size and the viability of ecological communities, the decline of species following habitat fragmentation, and the importance of corridors in enabling migration and recolonisation by both flora and fauna species. "Edge effects" (such as weed and pest invasion, fire) leading to deterioration in the ecological condition of small reserves are also well-known.

CEPA considers that AEM's proposal would exacerbate the pressures on the ecological condition of Bushmead and that, given the conservation value of the area, the best conservation result would be the establishment of a large, contiguous reserve that encompasses the areas of conservation value, minimises "edge effects" and provides for adequate habitat corridors. AEM's rationale that development some areas of bushland is justified because the native vegetation is more perturbed than in other localities on the site is not accepted. Much of the area proposed for development to the east of Kadina Brook, and the area near the rifle range proposed

for a primary school, appears to have the potential to regenerate given proper management and weed control. As indicated by the AHC and CALM, the relatively large size of this contiguous area is important for fauna habitat and movement. The maintenance of an in situ population of the Southern Brown Bandicoot would also have more chance of success if the animal's habitat is not fragmented.

Similarly, CEPA considers that AEM has failed to offer adequate substantiation for its arguments that degradation of Bushmead is inevitable and that effective conservation management of the area is impractical.

In determining the end use of the Bushmead land in relation to AEM's housing proposal, the high conservation and national estate value of parts of Bushmead needs to be weighed against the social goal of providing affordable housing in the Perth area, which is the rationale behind the Bushmead housing proposal. AEM's justification for the development of Bushmead for affordable housing is based on the perceived inability of the stocks of housing land to meet the future housing requirements of an expanding Perth population (Draft EIS, 2.6). It is pointed out in the Draft EIS that Homeswest's existing landholdings represent only 10 years' supply. The development of Bushmead is also seen as a contribution to urban consolidation and the avoidance of the undesirable environmental impacts of urban sprawl.

CEPA does not believe that AEM has put forward a compelling argument for the development of housing on the Bushmead site. No evidence is provided to indicate that other strategies, such as denser development of older urban areas, may not be able to address future housing needs. The potential contribution of AEM's proposed housing development to the stock of affordable housing is also comparatively minor. A significant proportion of the proposed housing development east of Kadina Brook is proposed for low density lots, which would be expected to be outside the range of purchasers seeking "affordable housing". As indicated in Part 5 of this report, the possible development of the areas at Bushmead currently used by the 10th Transport Squadron may also compensate for the "loss" of potential housing areas included in any future conservation reserve.

CEPA does not consider that the need for housing is such as to outweigh the effective protection of Bushmead's conservation values. Consequently, CEPA recommends that a large contiguous conservation reserve should be established at Bushmead. This conservation area should be centred on the areas placed on the Register of the National Estate. In order to improve the internal contiguity of the area and its connection to Gooseberry Hill National Park, it is further recommended that the following areas be included in the reserve:

- the Jarrah/Marri, Marri and Wandoo woodland areas between the south-east boundary of the national estate area and Ridge Hill Road;
- the Marri/Jarrah woodland area to the north-east of Kadina Brook; and
- the cleared rifle range between the two national estate areas in the north-west of Bushmead.

CEPA does not share AEM's view that public use of such a reserve would have a detrimental impact on its conservation values. While access may have to be controlled in some areas to allow rehabilitation, it is envisaged that low impact and well managed public use would be compatible with the conservation of the area.

In CEPA's view, the State nature conservation agency, CALM, would be the appropriate managing body for the reserve. This view is also shared by CALM in its submission. CEPA recommends that AEM and the Department of Defence initiate discussions with CALM on the feasibility of its management of the reserve and the most appropriate means by which this could be achieved. The question of the precise boundaries of the reserve should also be addressed in the discussions. The possibility of providing assistance to CALM through Commonwealth conservation management programs should be investigated by AEM, the Department of Defence and the Commonwealth agencies responsible for these programs.

The protection of the Southern Brown Bandicoot population at Bushmead is an unresolved issue and will be an important aspect of the management of the recommended conservation reserve. The conduct of a survey on the dynamics of the regional bandicoot population may assist in the development of appropriate measures for the protection of this population.

CEPA also considers that, in order to protect the integrity of the reserve to the greatest extent, public access roads should not pass through the reserve but should be restricted to its outer boundaries.

- Recommendation (a)* *That a conservation reserve be established at the Bushmead Rifle Range comprising areas which have been placed on the Interim List of the Register of the National Estate; the Jarrah/Marri, Marri and Wandoo woodland areas between the south-east boundary of the national estate area and Ridge Hill Road; the Marri/Jarrah woodland area to the north-east of Kadina Brook; and the cleared rifle range between the two national estate areas in the north-west of Bushmead.*
- Recommendation (b)* *That AEM and the Department of Defence hold discussions with CALM about the possibility of management of the proposed Bushmead conservation reserve by that agency and the most appropriate means by which that could be effected.*
- Recommendation (c)* *That measures for the protection of the Southern Brown Bandicoot population at Bushmead be developed based, if appropriate, on a study of the dynamics of the regional bandicoot population.*
- Recommendation (d)* *That public access roads should not pass through the recommended conservation reserve, but should be restricted to its outer boundaries.*

5. THE REMAINDER OF BUSHMEAD

CEPA considers that there may be a case for the development of housing on the Bushmead areas outside the areas recommended for a conservation reserve, provided that development is carried out in a manner that would avoid adverse impacts on the conservation reserve. Any more detailed plans for development of this land should be prepared in consultation with CEPA, the AHC, CALM and other relevant local and State planning authorities.

It is acknowledged that the size of the remaining area of the current housing proposal may affect its viability. Consequently, CEPA suggests that the land currently used by the 10th Transport Squadron might also be considered for housing development. Most of this land has not been included in the national estate listing, already contains buildings and roads, and is opposite the existing housing estate on Sadler Road.

CEPA cannot comment directly on the environmental impacts of a housing development that includes the 10th Transport Squadron area, as this would depend on the particular features of the development. However, it is likely that a significant part of such an environmental impact assessment would already have been covered in the assessment of the current EIS.

Recommendation (e) That any housing development on the remaining Bushmead land be conducted in a manner that would avoid adverse impacts on the recommended conservation reserve, and that detailed development plans for any such development be prepared in consultation with CEPA, the AHC, CALM and other relevant local and State planning authorities.

Recommendation (f) That AEM and the Department of Defence investigate the inclusion of the 10th Transport Squadron at Bushmead in any future housing development.

In the next part of this assessment report, CEPA considers aspects of the current proposal that have not been canvassed in Part 3 above. The purpose of these comments is to provide:

- further evidence for CEPA's conclusion that the area on the Interim List of the Register of the National Estate should be reserved for conservation;
- guidance for AEM and the Department of Defence should they decide to proceed with a proposal for the disposal of land for housing development on the remaining area at Bushmead.

6. ASSESSMENT OF OTHER IMPACTS AND ISSUES

6.1 Vegetation Protection

In its submission on the Draft EIS, CALM raised the concern that the proposed housing development may lead to additional runoff into Kadina Brook and a general rise in groundwater levels, which may have an adverse impact on native vegetation communities. In the Supplement, AEM acknowledged that native vegetation close to the creekline may be affected by increased flows in the creek, and proposed that retaining basins be built as part of the stormwater management system to limit this impact. In areas where groundwater rises close to the surface in winter, AEM proposes the installation of sub-surface drains installed at least 1 metre below ground level.

The impact on rising groundwater levels on native vegetation communities would be a less significant issue if CEPA's recommended conservation reserve were established. Nevertheless, potential adverse impacts on vegetation at Bushmead should be considered in any further housing development proposal for the remaining areas at Bushmead.

Recommendation (g) That stormwater retention basins and sub-surface drains, as proposed in the EIS, be included as appropriate in any further proposal for housing development at Bushmead on the areas outside of the recommended conservation reserve.

CALM and the Shire of Kalamunda recommended that dieback mapping of the Bushmead site should be undertaken to determine the current status of this disease before development commences. Another submission expressed concern about possible presence of dieback in introduced fill material destined for the site.

In response, AEM indicated in the Supplement that no introduced fill material would be used at Bushmead and that dieback mapping of the site was proposed during the preparation of the environmental management program.

Because of the potentially devastating impact of severe dieback infestations, CEPA supports the dieback mapping of Bushmead prior to the commencement of any works on the site. This applies to any construction (eg. visitor facilities, walking tracks) and rehabilitation works in the recommended conservation area, as well as any housing development works. Safeguards approved by CALM and the WA EPA should also be implemented during construction.

Recommendation (h) That dieback mapping of Bushmead should be carried out prior to any construction and rehabilitation works in either the recommended conservation reserve or any housing development in areas outside that reserve, and that safeguards (approved by CALM and the WA EPA) to prevent the spread of dieback should be implemented during construction activities.

6.2 Vegetation Rehabilitation

The Draft EIS proposes the rehabilitation of degraded vegetation in the proposed open space areas at Bushmead. CEPA supports the rehabilitation principles outlined by the proponent and the associated proposal for a rehabilitation management plan. It is not clear to what extent such a rehabilitation program would be applicable to the remaining Bushmead areas if the recommended conservation reserve is established. For instance, it may be appropriate for areas surrounding any housing development, particularly areas close to Kadina Brook, to be rehabilitated as a buffer zone between the housing and the conservation reserve. Such measures should be considered during consultations with relevant authorities on the development details of the Bushmead area outside of the recommended conservation reserve.

Recommendation (i) That appropriate vegetation rehabilitation measures for any housing development outside of the recommended conservation reserve be implemented by the developer in consultation with relevant authorities.

6.3 Soil Erosion

The Draft EIS acknowledged that the potential for soil erosion on the Bushmead site would be increased as a result of construction of the proposed housing development and proposed that areas of high soil erosion potential would either be occupied by lower density housing or would not be developed. AEM also proposed measures to minimise erosion during and after the construction phase.

If CEPA's recommendation for a conservation reserve is implemented, then the potential soil erosion impacts of any further housing development proposal and the risk of flooding would appear to be less than for the development proposed in the EIS. Nevertheless, CEPA supports the adoption of the controls and measures proposed by AEM in the EIS to reduce soil disturbance in any areas at Bushmead that are developed for housing. A monitoring program should be established to determine the effectiveness of these measures.

Recommendation (j) That measures to control soil erosion (including, as appropriate, those measures proposed in the EIS) be implemented in any housing construction outside of the recommended conservation reserve, and that the effectiveness of these measures be monitored with a view to implementing any necessary remedial action.

6.4 Soil Contamination and Unexploded Ordnance (UXO)

Concern about the build up of metals from spent ammunition in the Bushmead soil and the possibility of finding live ammunition during and after the construction phase was raised in submissions on the Draft EIS. The Health Department of WA also sought justification for the proposed cleanup criteria for zinc, copper, and arsenic, given that the concentrations of these metals at Bushmead are above the

Dutch B criteria in the ANZECC Guidelines for the Assessment and Management of Contaminated Sites. The Helena Valley/Boya Association considered that the Draft EIS did not adequately address the potential effectiveness of the proposed soil cleanup program, or the destination of contaminated material removed from the site.

AEM responded in the Supplement that the Dutch B criteria were designed as a trigger for environmental investigation and were not necessarily set up as cleanup criteria. It was pointed out that the areas within Bushmead known to be contaminated were proposed for recreational, rather than residential, purposes which would pose a lower risk to site users.

In the Draft EIS, AEM indicated that site development would not proceed until a site remediation plan (which would include the development of acceptable cleanup criteria) had been produced and approved by the relevant authorities. The development of a site remediation plan is also recommended by the WA EPA. Nevertheless, AEM acknowledged that there is still the potential for future residents or other users of the area to find live ammunition. The proponent recommends that caveats are entered against each individual title created at Bushmead requiring owners immediately to notify the relevant authorities of the discovery of any live ammunition or UXO.

CEPA considers that the cleanup of ammunition and UXO is important in relation to both the recommended conservation reserve and any future housing development. In relation to the former, it is possible that live ammunition or UXO might be encountered during construction and rehabilitation works and public recreational use.

Recommendation (k) Before commencement of any works on the Bushmead site or the opening of the area to public access, a site remediation plan for the cleanup of soil contaminants and ammunition or unexploded ordnance should be prepared and implemented to the satisfaction of the WA EPA and the Department of Health.

Recommendation (l) Caveats should be entered against each individual title created in relation to any future housing development at Bushmead requiring owners to immediately notify the relevant authorities of the discovery of any live ammunition or unexploded ordnance.

6.5 Water Quality

A total of 35 submissions referred to water quality issues. In response, AEM maintained in the Supplement that its proposed water quality protection and management program outlined in the Draft EIS would ensure adequate control of nutrient export from the project area during and after construction, and ensure acceptable standards of water quality entering natural surface watercourses from the development. It was indicated that approval for this program, prior to subdivision approval, would be sought from the WA EPA.

CEPA considers that the potential impact of housing development at Bushmead on water quality would be reduced if the recommended conservation reserve is established. However, the implementation of a water quality protection and management program along the lines proposed in the EIS is still seen as an important feature for any future housing development proposal outside of the recommended reserve. As a safeguard to the maintenance of acceptable water quality standards, CEPA supports the suggestion in the Draft EIS that Kadina Brook should be incorporated into existing monitoring programs co-ordinated by the Water Authority of WA and the Waterways Commission.

Recommendation (m): *That, in the event a housing development proceeds at Bushmead in the areas outside of the proposed conservation reserve, a water quality protection and management program as proposed in the EIS, including monitoring by the Water Authority of WA and the Waterways Commission, should be established.*

6.6 The Former Abattoir Effluent Disposal Site

In relation to the development of the former abattoir effluent disposal area, AEM expressed the view in the Supplement that contamination dilution of the soil had occurred since the disposal of abattoir effluent had ceased in 1982. AEM proposed that a detailed monitoring program would be instituted to determine longer term groundwater quality variations and to define the extent and depth of the contaminated plume. It was envisaged that this monitoring would be carried out on a 6 monthly basis by appropriately certified analytical laboratories on behalf of the developer. AEM did not agree with the WA EPA's recommendation that remediation work may be necessary and feasible prior to the subdivision of lots in this area, and that any work should meet with the satisfaction of the WA EPA and the Department of Health. AEM was concerned at the practicability and costs of the WA EPA's recommended actions and maintained that efforts should be concentrated on restricting access to groundwater and allowing natural dilution to take place.

CEPA considers that the WA EPA's recommendation for a contamination study would be the preferred approach if the former effluent disposal area were to be developed for housing. However, more consideration should be given to the question of whether housing is the appropriate use of the area, given its location as a potential window in the recommended conservation reserve and the likely management problems this would create. There may also be practical and economic problems in situating a housing development on a site relatively far removed from existing infrastructure. CEPA also considers that road access to the area should not pass through the conservation reserve, as this would lead to fragmentation of the reserve.

In CEPA's view, the possibility of including the former effluent disposal area in the conservation reserve should be investigated. Appropriate remediation work would need to be conducted if the area were to be managed effectively as part of the reserve.

Recommendation (n) That the feasibility of including the former abattoir effluent disposal area in the recommended conservation reserve be investigated in the context of the discussions with CALM referred to in recommendation (b).

6.7 Air Quality

A number of submissions raised concerns that odours released from two rendering plants located in Hazelmere would impact on the proposed housing development at Bushmead. A submission from a local brickworks company suggested that the urban development would lead to greater constraints on industrial emissions to the atmosphere as a direct result of pressure from residents in any new development in the vicinity.

In response, the Supplement reiterated the statement in the Draft EIS that the odours from neighbouring rendering plants will gradually contract over the next 5 years as compliance with current WA EPA licences come into effect. It was further indicated that by 1995 detectable odours would be limited to an area of 500 metre in radius from each plant, and that impacts on the Bushmead area are expected to be minimal.

The Draft EIS noted that the brickworks was located sufficiently far away to avoid any significant air quality impact and that the conservation area located across the northern end of the Bushmead site would serve to buffer residents from abnormal emissions. CEPA suggests that the issue of emissions from the brickworks be taken up with the WA EPA in the context of detailed planning for any further housing development proposal at Bushmead.

Some submissions were concerned about photochemical smog affecting the foothills region of Perth and indicated that the WA EPA was undertaking a 3 year airshed study to determine to extent of this problem. AEM indicated in the Supplement that the WA EPA airshed study, once completed, would probably have an impact on the future planning for the Perth metropolitan area. It was pointed out, however, that the WA EPA has recommended that planning and development in the foothills' corridors proceed during the course of this study.

CEPA is of the view that its recommended option of retaining the vast majority of the Bushmead site as a conservation reserve would have a positive impact on the future air quality of the surrounding region. It is suggested that, as far as possible at the time, any housing development proposed for the areas outside of the recommended conservation reserve should take account of the results of the WA EPA's airshed study.

6.8 Earthquake Risk

The Helena Valley/Boya Association expressed concern about the suitability of Bushmead for residential development because, on the basis of information from the Mundaring Geophysical Observatory, there was a 10% or more probability of a Category 7 earthquake within a 50 year period.

AEM sought clarification of this issue from the Observatory. In the Supplement, the Observatory is reported to have indicated that the Perth metropolitan area lies in a region where an intensity 6 earthquake has a 10% probability of occurring in a 50 year period. An earthquake of this magnitude would cause only minor damage to houses in the Perth metropolitan area, because housing design and foundation requirements in Perth provide a reasonable resistance to earthquake damage. The Draft EIS indicated that these construction standards and conditions would be met at Bushmead and that the level of earthquake risk at Bushmead would be similar to most other areas in the Perth metropolitan area.

CEPA is satisfied with this response.

6.9 Aircraft Noise

The Helena Valley/Boya Association raised the issue of whether housing development is acceptable at Bushmead because of aircraft noise from the nearby Perth International Airport.

In the Supplement, AEM indicated that aircraft noise was taken into account when planning the location of housing within the Bushmead development. In accordance with WA EPA policy, areas within the 20 Australian Noise Exposure Composites (ANEC) contours for the airport were deemed to be unacceptable for residential use. The 20 ANEC contours used by AEM were also based on the situation if a proposed parallel runway were developed. Only the northern end of the Bushmead site, where the existing rifle range is located, comes within this projected 20 ANEC contour.

CEPA accepts AEM's approach to this issue. The areas recommended for further investigation for housing development outside of the recommended conservation reserve would not come within the 20 ANEC contours as described by AEM.

6.10 Construction Management

In the Draft EIS, AEM made a number of commitments in relation to the minimisation of environmental impacts during the construction of the proposed housing development. These commitments include measures for the control of weed introduction, dust suppression, noise reduction and the disposal of waste. CEPA considers that such measures would also be applicable to any housing development that was considered for the areas outside of the recommended conservation reserve.

Recommendation (o) That measures proposed in the EIS for the control of environmental impacts during construction activities would also be appropriate for any further housing development proposal for the areas at Bushmead outside of the recommended conservation reserve.

6.11 Road and Traffic Impacts

Concerns about increased traffic noise and levels and increased pressure on local roads were raised in response to the Draft EIS. The Department of Planning and Urban Development also raised a number of issues in relation to traffic and transport arrangements, including the conduct of a traffic impact study.

CEPA considers that a traffic impact study should be conducted in relation to any future proposed road developments at Bushmead, whether in relation to access to the recommended conservation reserve or any housing development on other areas.

Recommendation (p): That a traffic impact study should be conducted in relation to any future proposed road developments at Bushmead, whether in relation to access to the recommended conservation reserve or any housing development on other areas.

6.12 Aboriginal Significance

The Draft EIS describes the results of archaeological surveys of Bushmead in 1989 and earlier, which found a limited number of disturbed artefact scatters considered to be of limited significance in archaeological terms. Consultants for the proponent also conducted research into the Aboriginal ethnographic significance of Bushmead in 1989 and 1991. This research included interviews with Aboriginal people associated with the general area in which Bushmead is located. A separate consultant was engaged to undertake the second round of consultations because one Aboriginal group refused to deal with the original consultants. It was concluded that no ethnographic sites, as defined under the (WA) *Aboriginal Heritage Act 1972*, were present within Bushmead.

The conclusions in the Draft EIS were contested by the Aboriginal group, the Fringedwellers of the Swan Valley, in their submission. The Fringedwellers claim that the Bushmead area is significant to them, that information provided to the consultants was misunderstood and that the consultations were undertaken in inappropriate ways. They also claim that the second consultant commissioned as a "neutral party" had actually sought the advice of the original consultants to whom the Fringedwellers had objected. They request that another consultant acceptable to them be commissioned to investigate the Aboriginal significance of the Bushmead area.

In the Supplement, AEM casts doubt on the Fringedwellers' claims of ethnographic significance for Bushmead, suggesting that such claims were only made after the group became aware of the archaeological sites in the area. AEM points out that it has received clearance to use the Bushmead site for residential purposes from the WA Minister for Aboriginal Affairs under the *Aboriginal Heritage Act 1972*, based on the information gathered during the EIS study process.

The Aboriginal and Torres Strait Islander Commission (ATSIC), in a comment on the draft Supplement, considers that the concerns raised by the Fringedwellers have not

been adequately addressed in the Supplement. ATSIC suggests that an independent assessment of the Aboriginal significance of Bushmead be conducted.

In view of the Fringedwellers' concerns, CEPA believes that this issue remains unresolved and concurs with ATSIC's suggestion that an independent assessment be conducted. Given CEPA's recommendation for the establishment of a conservation reserve at Bushmead, this assessment would most appropriately be conducted in the context of the development of a management regime for that reserve. The assessment should also be conducted before any housing development plans for the remaining areas at Bushmead are finalised.

Recommendation (q) That an independent assessment of the Aboriginal significance of Bushmead be carried out by a consultant acceptable to the Fringedwellers of the Swan Valley before arrangements for the management of the recommended conservation reserve and any housing development plans for the remaining areas at Bushmead are finalised.

6.13 Environmental Management Program (EMP)

AEM proposes to develop and implement an EMP during the construction and establishment of the housing development. This program is intended to provide the framework for the ameliorative actions and monitoring procedures necessary to prevent or mitigate potentially adverse environmental effects. AEM proposes that the main responsibility for implementation of the monitoring program, for at least the first 5 years, would lie with the developer, with the assistance of responsible State and local authorities which would assume responsibility at the end of this time.

CEPA considers that the development and implementation of an EMP along the lines proposed by AEM in the EIS would be an important aspect of the management of any housing development that occurs at Bushmead. Such an EMP should include the relevant recommendations made by CEPA in this report. It should be prepared in consultation with CEPA, the AHC and relevant State and local authorities, and should be provided to these authorities for comment prior to the commencement of construction. In CEPA's opinion, the developer's responsibility for monitoring impacts of any development should not cease until the completion of the construction work and any rehabilitation measures. A close working relationship should be maintained with the relevant State and local authorities during this time to assist in an eventual effective transfer of responsibility from the developer to those authorities.

AEM also proposes to bind contractually the proposed developer, Homeswest, or any other contender, to specific requirements and commitments in respect of environmental protection and management measures that have been identified in the EIS process. CEPA is in full support of this measure, which should be implemented in association with the EMP.

- Recommendation (r)* *That an Environmental Management Program (EMP) for any housing development at Bushmead outside of the recommended conservation reserve should be prepared in consultation with CEPA, the AHC and relevant State and local authorities, and provided to CEPA and these authorities for comment prior to the commencement of the development.*
- Recommendation (s)* *That the developer's responsibility for implementing the EMP should not cease until the completion of the construction phase and any rehabilitation measures, and that after this period responsibility should be transferred to the relevant State and local authorities.*
- Recommendation (t)* *That the developer of any housing development be bound contractually to specific environmental requirements and commitments identified in the EIS process and CEPA's assessment report, and that this measure be implemented in association with the EMP.*